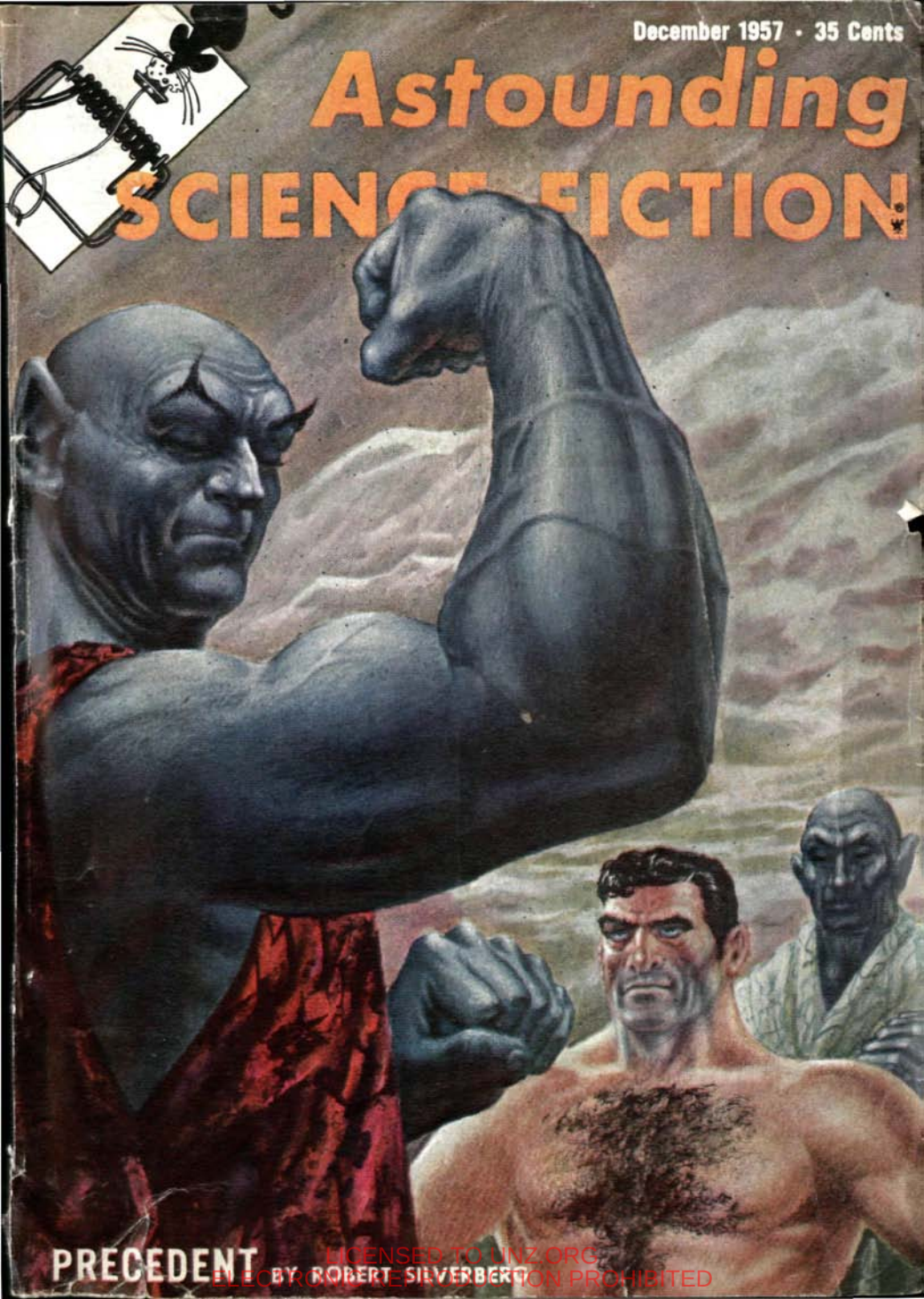


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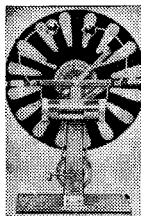


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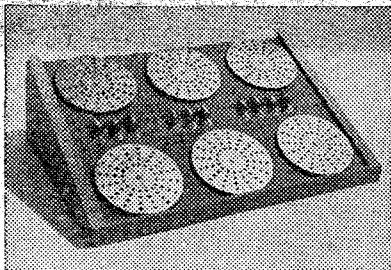
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DEMONSTRATION

PART I

To a mathematician, "to demonstrate" means to produce a valid sequence of mathematical logic yielding as a conclusion the proposition being demonstrated. "*Quod erat demonstrandum*" in the classical phrase.

The development of physical science as an intellectual discipline has brought in the concept of "demonstration" which has to do with a physical-action display. But the question I'd like to bring up is . . . precisely *what* relationship does it have to physical-action display? Precisely what does "a demonstration" mean in modern science?

The thing that makes it tricky is that Logic, which is our principal formal tool of intellectual communication, is not in one-to-one correspondence with physical reality. Mathematical demonstration can be fully defined; Logic in the full, formal sense, works only when *all the relevant data* are available. In mathematics, the logician is working in

a "universe of discourse"; that universe contains all the characteristics he assigns it, and none that he has not assigned it. It has no unsuspected characteristics, however many hitherto unrecognized deductions may be possible. A mathematical problem in x , y , and z , for instance, can never have an unsuspected w acting on the equations so that the x , y , z system won't balance.

But when physicists tried calculating atomic behavior in terms of electrons and protons, their mathematical equations might balance perfectly . . . but the real atoms didn't match so good. There were unsuspected neutrons, neutrinos, positrons, and other factors unbalancing the system.

Mathematical demonstrations can be clear, clean, and definitive; they work in a universe defined in full by the mathematician.

Physical science finds mathematics enormously helpful . . . but "demonstration" in physical science involves

something other than the neat, clean, and complete mathematical-logic type demonstration.

Fine . . . but what *does* it involve, precisely? What *does* constitute "a demonstration"?

Part of the problem of defining that is that we can't define "meaning." Every human being has a conviction that the term "meaning" has a reality-referent—but no one yet has been able to define that referent. Facts are not a demonstration, because demonstration involves a clear communication of meaning of the facts—which gets difficult when "meaning" itself can't be defined.

For example, I can give photographic "demonstration" of a fact; that I can hang unsupported in mid air. The photograph will be a completely honest, unretouched photograph, of perfect clarity; it involves no montage work, or anything of the sort, no concealed wires or anything else. It can be done with a three-axis photographic set-up, showing the demonstration from three viewpoints at the same instant. All I need is a properly equipped modern professional photographic studio, with an adequate bank of 1/100,000th second electronic flash lamps.

Now this would be a true, valid, genuine demonstration of the fact that I can hang unsupported in mid air; that would be precisely what I would, in fact, do. The only problem here is the definition, the meaning, of the term "hang." Long ago, H. G. Wells, in his "Time Machine" story, brought up the question of whether

an "instantaneous cube" existed. If something exists for less than one ten-trillionth of a second, can it be said to exist?

Recent studies indicate that the energy-production in some of the older—and most brilliant—stars comes from helium thermonuclear reactions, which depend on a chain of reactions going through the beryllium isotope, Be-8. But Be-8 has a half-life of about 10^{-15} seconds—about one quadrillionth of a second. Something which exists for so short a time doesn't really exist within the meaning of "exist," does it? By the time a star's core reaches the densities and temperatures involved in these helium thermonuclear reactions, interparticle collisions occur so fast that even 10^{-15} seconds becomes an appreciable period.

There's another tough problem. Suppose a man has a wonderful new theory of how the phenomenon of fahrmstahling takes place. He's convinced that it happens because of process Zeta. So he sets out to prove his theory by finding data to fit his theory; he even tortures normal phenomena into wild and wonderful improbabilities to force the data he needs to appear.

Now is this weird set-up he arranges to be called "cooking the data to fit the theory" or "performing a crucial experiment"?

Lord Rutherford claimed that the elements could be transmuted by the action of radioactivity radiations. By the use of a weird contraption in-

volving a rubber bulb, an inverted Ehrlenmeyer flask nearly filled with India-ink stained water, and a little radium, he got some photographs of some cloudiness which he claimed showed transmutation was possible. Was this cooking the data to fit a theory, or a crucial experiment? All he actually demonstrated was that water vapor will condense to form fog when a saturated volume of vapor-in-air is suddenly expanded. Furthermore, he couldn't demonstrate the phenomenon on demand; he had only a few pictures that he claimed were proof of his theory.

Current nuclear research work being done with the Bevatron in California cannot be duplicated in other laboratories elsewhere. There's only one Bevatron. Are these experiments "repeatable experiments," then? What does the term mean?

Some recent studies on the mechanism of corrosion inhibitors lead to a theory that the size of the ion of the inhibitor had a lot to do with it. In order to demonstrate their theory, however, the researchers had to cook up something to prove their point—they synthesized their data-yielding material, since nothing in nature confirmed their idea. They made up a corrosion-inhibiting solution of technitium, which doesn't exist in nature and had to be synthesized in a nuclear reactor.

During WWII, when radar was first being used, it proved remarkably peculiar in its behavior. It did things that everybody knew were impossible;

microwave radar can't reach from the Caribbean to the Portuguese coast . . . but it did every now and then, to the confusion of all concerned.

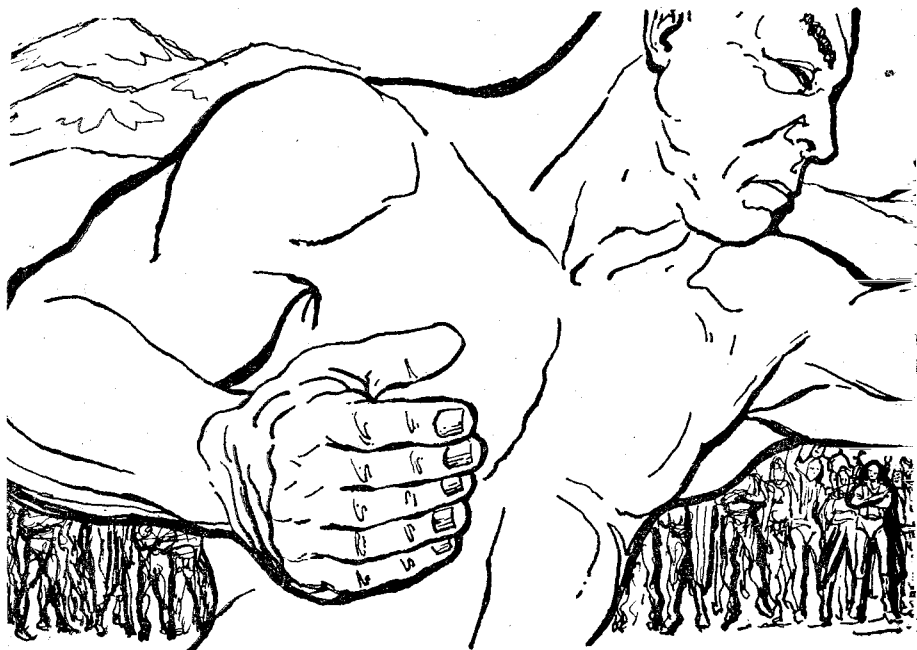
The inverse square law could readily show that Marconi's signals couldn't be picked up across the Atlantic, and anyone who knew anything about electromagnetic radiation would know that the curvature of the Earth would completely block signals from England to America. (Ionosphere reflection wasn't so well known in those days.)

It was the radio amateurs who discovered some of the wild and unpredictable phenomena of very high frequency radio propagation—things like ion-clouds in the upper stratosphere, and radio reflection from the ionized trails left by meteors.

The concept "demonstration" becomes extremely difficult to handle in these areas. The hams who first started getting radio contact at the very high frequencies, over impossible distances—such frequencies aren't reflected by the ionosphere, and are, normally, limited to line-of-sight—didn't have any explanation for the phenomenon. It just happened that Bill, in New York, contacted Bob, in Chicago, on a frequency band that couldn't possibly do it, and carried on an exchange of information sufficient to allow them to identify each other, and confirm the contact by mail.

They would have been utterly unable to demonstrate the phenomenon on demand before competent wit-

(Continued on page 159)



PRECEDENT

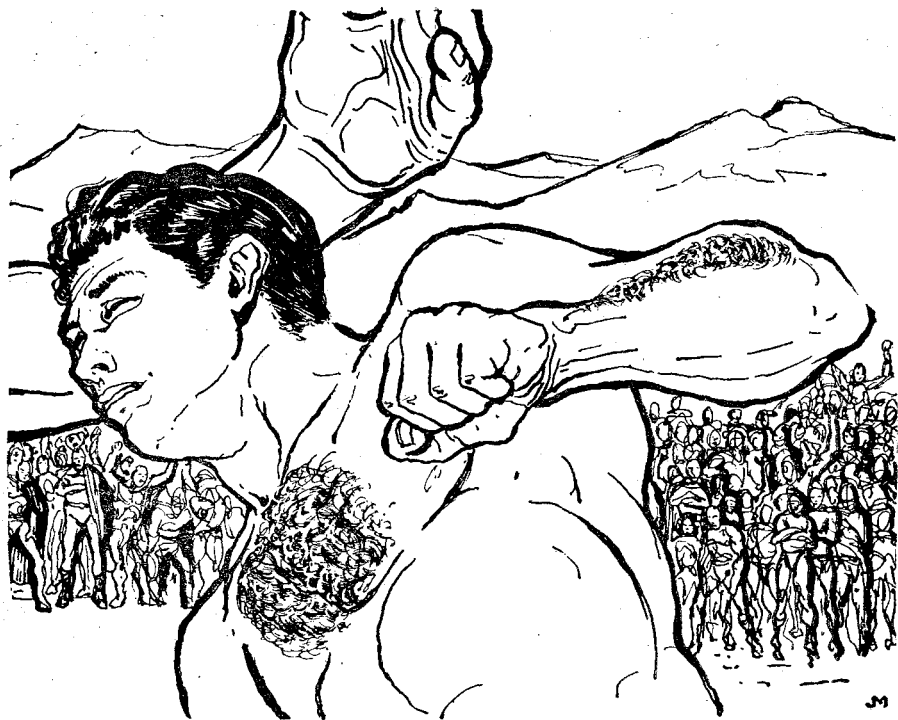
One of the best ways to convince someone he's got a wrong idea is to mousetrap him into trying to make it work ... when it simply can't be made to work.

BY ROBERT SILVERBERG

Illustrated by Martinez

On the second day of the third week since the Terran mission had arrived on Leeminorr, Lieutenant Blair Pickering committed an outrageous crime. Within an hour, news of what Pickering had done had percolated back to the Terran base.

There, Colonel Lorne Norden studied the situation very carefully. Norden was commanding officer of the Terran Cultural and Military Mission on Leeminorr. The actions of his men were, ultimately, his responsibility. And since the Leemi-



norrans were touchy, formalistic, custom-bound people, highly conscious of the presence of Terrans among them, Norden gave the matter of Pickering's behavior particularly careful attention. He would have to make a decision in the case, and he knew clearly and well the consequences of a wrong-headed decision. The Corps kept careful records. There was a considerable body of precedent.

And precedent dictated special handling for the Pickering case.

The incident had taken place shortly before noon—noon, the

holiest hour on Leeminorr. Now, it was one-thirty; the midday repose was ended, and Norden knew it would not be long before indignant Leeminorrans arrived to begin filing their formal complaints.

The Terran camp was eight miles outside the town of Irkhiq, a village of perhaps three thousand Leeminorrans, built radially out from their temple. Norden's office was, coincidentally, located in the same relative position to the other Terran buildings as the Irkhiq temple was to the village surrounding it. It had been sheer accident—the master-plan for

Cultural and Military outposts dictated the arrangement—but it had worked out well.

Norden himself waited patiently behind his desk for the first delegation to arrive. He was of medium height, but stocky and thick-muscled; for some reason his legs were short and dumpy, but when everyone was seated around a conference table Norden seemed the biggest man in the room. His hands were enormous; his forearms, massive and corded. He had been in the Service nineteen years. This was the eighth world on which he had served. He had taken his degree in Sociometrics at the University of Chicago in 2685, and five years later had won his commission in the Space Service Military Wing.

He made methodical, crisp notations in the log while waiting. Norden was not a man for brooding idly—and, as for developing a strategy to cope with the potentially explosive situation shaping up, he had done that a long time before.

At 1400 sharp his office communicator glowed. Norden reached smoothly for the stud, switched it on, and said: "Norden here. What goes?"

"Five Leeminorrans here to see you, sir. They look disturbed. It's about this Pickering business, I think. Should I send them in?"

"At once."

Norden tidied his desk, swung around in his chair, and waited. After a moment the doorphone

buzzed hesitantly, a timid droning sound.

"Come in," Norden said.

Five Leeminorrans entered, single file, their faces grave and severe. They arranged themselves in an open circle, their leader facing Norden, flanked by two of them at each side.

Norden had always felt faintly uncomfortable in the presence of the Leeminorrans. A short man himself, he had learned to feel distrust for taller people—and the Leeminorrans were tall. They stood nearly seven feet in height, magnificent humanoid specimens with powerful-looking shoulders and brawny frames. Five of them, five males, in the discordantly-colored clothing of anger, savage reds shot through with raging violets and blacks. Their arms and legs were bare, allowing view of the superb muscles. The Leeminorrans had oiled themselves, applying the rancid animal fat that gave sheen and glow to their sleek metallic-blue skins.

Ten eyes, red-rimmed and feral, stared at him. Five lipless slitte mouths scowled down. Five angular-featured alien faces glowered at him. There was a long moment of silence in the room.

Five pairs of arms were extended in a ritual greeting: arms out, palms up, then fists clenched, biceps flexed. Impassively Norden watched the muscles bulge. Without rising, he acknowledged the greeting with three crisp, short Leeminorran syllables.

"You are Colonel Norden?" asked the foremost of the Leeminorrans. His voice was deep and big; it rattled in the cavern of his chest a moment before booming forth into the little room.

"I am," Norden said.

"I am Ahruntinok, Guardian of the Truth. I bring greetings from the Overman of Irkhiq, whose chosen representative I am."

Norden nodded. "The Overman is welcome here himself, of course."

"The Overman did not choose to come," replied Ahruntinok stonily. He gestured at his four companions. "I bring with me two priests of the temple, and two servants of the Overman. They, too, offer you greetings."

The four flankers bent their knees solemnly, without speaking. Equally silently, Norden nodded response.

The preliminaries over, Ahruntinok glared down at Norden and said, "You have heard of what took place in Irkhiq this morning?"

"Perhaps. I heard what may have been a distorted account of the event. How does the Overman see it, Ahruntinok?"

"As blasphemy," came the flat, cold reply.

"Suppose you tell me what happened," Norden suggested. With a casual gesture of his left hand he flicked on the autotype; it would be important to have a recording of Ahruntinok's statement later, he knew.

The alien squinted suspiciously at

the device as it came humming into life, but made no protest. He said, "It was morning in the village, the sun climbing high toward the top of the sky, when your Pickering and his men arrived in the small car you use for riding in. They drove through the outer streets of Irkhiq as they do every morning. They passed the temple. It was nearly the moment of noon, when the sun's rays strike the front steps of the temple, purifying it for that day and making it possible for us to enter and pray.

"Several of us were there when Pickering came along. He entered the temple courtyard. He ignored the cries of the priests in attendance and passed over the steps *at the same moment as the rays of the sun!* Then he proceeded to sit on the steps, draw a foodpack from his uniform pocket, and eat. The priests continued to protest, but he paid no attention to them. When he was finished eating, he crumpled his refuse paper and left it where he sat; then, he returned to his vehicle and rode away. The temple is polluted. The purification ceremony will take days."

Ahruntinok paused. His face was bleak; his arms were folded, one six-fingered hand grasping each elbow in an aggressive, accusing manner.

"Lieutenant Pickering has committed blasphemy," the alien said. "He must be tried in full court and punished for this, or else the temple's purification will be made much more difficult."

Norden closed his eyes for a moment, then opened them—and when he opened them, they were hard and searching. "Pickering's in his quarters now. I haven't spoken to him yet. I want to hear his side of this case."

"How long will that take?"

"Are you in a hurry?"

"The people must travel to the next town to pray. We wish to hold the trial tonight and carry out the sentence on him tomorrow. The Festival of Days is coming; Irkhiq would be forever disgraced if our temple were impure at Festival-time."

"I see. It'll be a quick trial, then. I suppose you have the verdict all prepared, and it's just a simple matter to run through the legal formalities."

"Lieutenant Pickering has committed blasphemy," the alien repeated sonorously. "The penalty for that is severe. And you Earthmen have agreed to abide by the laws of Leeminorr while you remain here. Surely you won't raise any objection to the trial?"

Norden smiled, but it was an unfriendly, businesslike smile. "The implication's unwarranted, Ahruntinok. We've bound ourselves by precedent to abide by local law. If a member of this mission has broken the law, we have to let him be tried by Leeminorran courts. Naturally we're interested in getting a fair trial for our man."

"He will have justice," Ahruntinok said.

"Good. Come back in five hours

and see me again. I'll have Pickering ready for you by then."

"Excellent."

The aliens went into the ritual farewell-pattern. It took nearly five minutes before they were through flexing muscles, stooping, and praying. Then they turned and left Norden's office.

Norden sat perfectly still for perhaps thirty seconds, reviewing in his mind the conversation just concluded. He would have to report this to Earth, of course. Close contact with home base was an essential characteristic of this sort of work.

And home base would be interested. After four years, another Markin case had finally come up. The Devall Precedent had taken effect: *If an Earthman breaks a law of the planet where he is stationed, the aliens have the right to request trial by their own legal processes.*

Colonel John Devall had put that rule on the books back in 2705, on the planet Markin, World 7 of System 1106-sub-a. Devall had created a precedent, and it was intrinsic to the nature of the Terran missions to alien worlds that precedents be obeyed. Earth had to appear to the lesser worlds who received Earth's aid as an unchangeable, perfectly consistent culture—otherwise, there might be large-scale distrust.

If an Earth mission on one planet behaved in a certain manner, the other Earth missions would have to conform. It was necessary to present unity of objective as a characteristic of Earthmen.

Devall had set a precedent. *And, thought Norden, we're stuck with it!*

Strictly speaking, the parallel did not hold true in all respects. The earlier case had been somewhat different.

According to the tapes of the Devall case, a member of the Terran mission to Markin—a Lieutenant Paul Leonards, botanist—had been on a field trip with two other Earthmen. Discovering a secluded grove, they entered it and proceeded to photograph and take samples from any previously unknown botanical specimens. Suddenly they had been challenged by an armed alien; he attacked violently, ignoring a command by Lieutenant Leonards to lower his spear and explain his actions. When he charged with the spear, the lieutenant had been forced to kill him in self-defense.

But then complications began when the Earthmen returned to their base. Protesting aliens declared Leonards had entered a sacred grove and had slain the guardian. They demanded the right to try the Earthman by an ecclesiastical court.

It was then that Colonel Devall had made his famous decision. Devall had been an anthropologist, with a competent though undistinguished service record that had seen him lead missions to eleven worlds.

The problem had never come up before in the great Terran aid program. The aliens refused to listen to the argument that Leonards had had no way of knowing he was

trespassing on sacred ground, and that he had killed the guardian only in self-defense. Intent had no place in Markin law; only the sheer pragmatic fact of the law-violation itself concerned them, and that had to be required.

In the end Devall had handed Leonards over for trial, as the aliens requested. Devall had considered the matter long and deeply, and had concluded that in the spirit of fairness this was the only thing he could do. The Terrans lived among the aliens, and, reasoned Devall, they should therefore be bound by their laws.

Luckily for him, the lieutenant had escaped serious harm. It had been trial by ordeal, and they had thrown him in a lake and left him to the mercies of two of the dead man's brothers. But he outswam them, reached safety, and thus was declared not guilty.

Norden was familiar with the case. It was classic in the Corps' annals. He had pondered its implications, second-guessed Colonel Devall, thought the thing through with dogged detailed analysis.

And now his turn had come. Lieutenant Pickering of his staff had blasphemed—not accidentally, as had the man on Markin, but knowingly.

The aliens were aware of the Markin precedent. They were anxious to try an Earthman.

Well, thought Norden, they'll get their wish. Pickering is theirs to try. Let them hold us to the Devall Precedent—but they may not like it!

Norden made some log notations, finishing off his weather report and adding three or four references to general mission progress, on the several fronts of survey work, anthropological research, and technological-medical aid. Each mission had a threefold job, and was staffed to handle it. It carried out an exhaustive botanical and zoological survey of the planet, taking as many specimens as possible; it performed cultural research among the inhabitants; and—on those worlds where the natives would permit it—Terran experts offered assistance in raising living standards.

At the same time, of course, an assessment of the planet's military value was made. It was a precautionary move. The galaxy was a near-infinite place; there was no telling when or from where a hostile and dangerous race might arrive, and it helped to have a network of friendly allies spread out across thousands of light-years.

Earth had never run across a world that was its equal technologically or philosophically; whether it was a matter of earlier evolution or luck along the way was impossible to determine, but the fact was undeniable that of the several thousand inhabited worlds visited by the survey teams in the four centuries since the development of interstellar travel, not one had reached a cultural level on a plane with Earth's.

An aid program, then, was a logical necessity. But it had to be handled with tact; sheer altruism was a

difficult concept to put across, at times.

Norden finished his morning's work and restored the log to its file. Then, closing down the office equipment, he headed out into the chill Leeminorran afternoon. A bitter wind was blowing, tossing swept-up gusts of snow about in the compound. Harsh dark clouds scudded overhead, and far off near the mountain tops, inches above the horizon, Norden saw the bleak unwarm brightness of Leeminorr's unfriendly sun.

This was a hard, infertile world. The Leeminorrans were sturdy people who gloried in exposing their bodies to the elements, whose philosophy was based on conflict and whose lives were battle-studded and tough. It was not a mechanically advanced world; communication was poor, transportation crude though adequate. The Leeminorrans recognized the need for the aid the Terrans offered, but they fought hard to maintain their nobility and aloofness even while receiving help. An important part of Norden's job was to see to it that the Terran assistance program never began to seem to the Leeminorrans like a distribution of largess.

He turned off at the communications center. Norden nodded to the signal officer and said, "Has that sub-radio solidophone contact with Earth come through yet?"

"Just about to call you, sir. Director Thornton's waiting to see you."

"Thanks," Norden replied curtly,

and stepped into the green lambency of the solido field.

Director Thornton sat back of a dark-grained bare desk ornamented in the Kauolanii tradition. He was a lean man, well along in years, thin-lipped, tight-faced, with a dry weather-hewn look about him.

He and Norden knew each other well. Norden had served under him on his own break-in cruise, long before Thornton had gone to Rio de Janeiro to take over the all-important post as Director of the Department of Extraterrestrial Affairs. Now Thornton sat poised, unspeaking, unsmiling, waiting to hear what Norden had to say to him.

The colonel said, "It happened, finally. Another Devall affair."

Thornton smiled emotionlessly. "I had been wondering how long it would take. It's so easy to trespass on territory whose laws we hardly understand. The surprising thing is that this is only the second time."

"The aliens were here to see me not long ago. Naturally they demand the same privilege Devall granted on Markin. It's another blasphemy case."

"Of course," Thornton said. "The Leeminorrans are at the same general culture-level as the Marks. At that stage they're likely to be highly blasphemy-conscious. When's the trial?"

"Tomorrow, probably. They'll be back to get the man soon. A full report's on its way to you via autotype. It ought to reach you soon."

Thornton nodded. "What action have you taken, colonel?"

"The man will be handed over for trial—naturally. I don't feel called on to deviate from the Devall Precedent. The aliens expect that kind of treatment."

"Naturally."

"There may be some outcry on Earth, sir. I'd like to request that you refrain from announcing anything about the trial until its conclusion."

Director Thornton looked doubtful. "It's not our usual policy to suppress news, colonel. Is there some special reason for this request?"

"There is," Norden replied. "I'd prefer to wait until I have more definite data on the problem here." He stared levelly at Thornton and added, "In the hope of preventing future Devall Precedents. My actions will bind all my successors. I'd like to simplify things for them—and help the Leeminorrans at the same time."

Thornton ran his thin fingers along the elegantly-carved rim of his desk a moment or two, considering Norden's request. A smile spread slowly over his features.

"Very well, colonel. Request granted. I'll maintain a news-curtain over the Leeminorran situation until hearing from you again. Report to me when the trial's over, of course."

"Yes, sir. Thank you, sir."

Norden stepped back out of the fading field. The last he saw of Director Thornton before the solido-phone pattern shattered was the director's face, smiling encouragingly. It was not often that Thornton smiled.

Norden pulled his jumper tight around him and stepped out into the chilly wind.

Thornton had understood him—the smile said as much. Now it was Norden's turn to smile.

An organization such as the Corps operated on precedent. Precedents, then, were not to be broken lightly.

But, thought Norden, there was nothing in the rules against *bending* them a little.

The delegation from Irkhiq was back at sundown, only this time there were six of them. Ahruntinok led the way, striding magnificently into the compound wearing a blazing red cloak twined with vruuk-feathers and tinged with gold; behind him came the two representatives of the priesthood, the two delegates from the secular government, and a sixth figure, gaunt and bowed.

Watching from the window of his office as the group entered the compound, Norden turned his attention particularly to this sixth man. He was old, much older than any of the other five, and yet he still had majesty in his stride even though his shoulders now sloped in and downward, even though his skin had lost the radiant gleam of young warriorhood.

He wore rich robes, draped thickly over his angular body—but his arms and legs were bare, in Leeminorran fashion, and on them Norden could see the welts and scars of a lifetime of combat. He walked slow-

ly, with a steady tread, and held himself proudly erect. *This one was a man, once*, Norden thought. *He knew how to fight.*

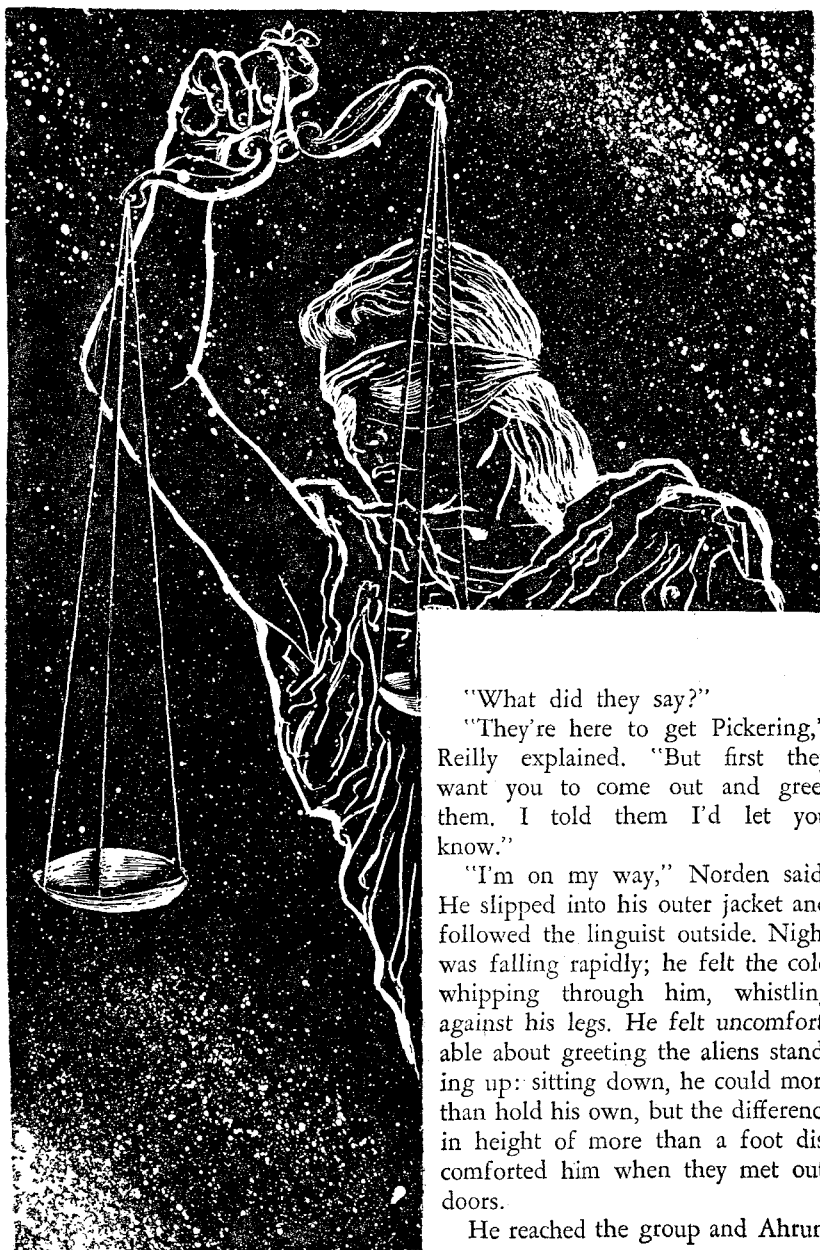
The men were gathering around the compound, watching the slow procession with interest. Norden saw Gomez, the anthropologist in charge, surreptitiously snap a tridim shot of the sextet as it stalked past. The sun was down, and night was coming billowing in; the compound lights were on. Above, the tiny splinter of gleaming rock that was Leeminorr's sole excuse for a moon was rising across the sky, beginning its retrograde evening's course.

The thermometer just outside the window read fifty-two. Not cold, really, but certainly uninviting enough weather—but there was that old alien, looking seventy or eighty or perhaps ninety, strutting up the hill with arms and legs exposed. These were tough customers, Norden admitted admiringly.

The Leeminorrans reached the top of the little rise and gathered there, waiting. Ahruntinok stood facing Norden's two-story residence, staring in; Norden wondered whether the alien could see him, even in the darkness of twilight. He waited; after a moment he saw Reilly, the chief linguist, hesitantly approach the aliens.

They spoke with each other a few moments, with much bowing and gesticulating. Then Reilly detached himself from the group and crossed the clearing to Norden's place.

Norden met him at the door.



"What did they say?"

"They're here to get Pickering," Reilly explained. "But first they want you to come out and greet them. I told them I'd let you know."

"I'm on my way," Norden said. He slipped into his outer jacket and followed the linguist outside. Night was falling rapidly; he felt the cold whipping through him, whistling against his legs. He felt uncomfortable about greeting the aliens standing up: sitting down, he could more than hold his own, but the difference in height of more than a foot discomforted him when they met outdoors.

He reached the group and Ahrun-

tinok offered a ritual greeting. Norden responded.

"The trial will be held tomorrow," Ahruntinok said. "I have brought the judge." He indicated the old man. "Mahrlek, Grand Judge of Irkhiq. He will pass judgment on the Earthman."

The battle-scarred oldster lowered himself in an elaborate bow; Norden did his best to return it, while the five other aliens glowered sourly at him.

"You will give us the man Pickering now," said Ahruntinok when the greeting was concluded. "Tonight he must remain in Irkhiq. Tomorrow will be the trial."

"Where will the trial be held?" Norden asked.

"Irkhiq. Before the temple. The entire village will be present."

Norden was silent for a moment. At length he said, "Of course, other Earthmen can attend the trial?"

Ahruntinok's face darkened and he said, "There is nothing prohibiting their presence. You will not be permitted to interfere with the trial."

"I simply want to watch it," Norden said.

The big alien snorted suspiciously, but said nothing. The old judge stepped to the fore and said, "The night grows cold. Give us the prisoner."

Norden paused again. He wondered how Devall had faced the actual moment of transfer of possession, when the life of a Terran was given over into alien hands. It must have been a bleak moment for the man.

He turned and caught sight of Sergeant Heong standing some forty feet away, taking down the proceedings with a portable recorder.

"Heong, go get Lieutenant Pickering," Norden ordered crisply.

"Yes, sir."

Leaving the recorder on, Heong set out across the yard on a jogtrot toward the officers' barracks, where Pickering had been confined pending resolution of the case. Norden saw the sergeant pounding at the door; then he disappeared within, and he returned a moment later followed by the bulky figure of Lieutenant Blair Pickering.

The wind swept low over the camp as Pickering appeared. Norden shivered involuntarily; the temperature was beginning its nightly drop. By 2200 or so, the thermometer would be hovering close to zero, and the wind would shriek like a tormented demon all the bleak night.

Heong and Pickering drew near. The lieutenant was in full uniform, braid and all, though he had left off the ornamental blaster. His boots were polished to mirror intensity; he looked fresh and imposing.

For a moment Norden and Pickering eyed each other. Pickering was a big man, with all of Norden's swelling muscularity plus the long legs that should have been his; he stood six-four, big enough by Norden's standards but still nearly half a foot shorter than Ahruntinok. His face was dark and shadowy, craggy-featured, with a thick beak of a nose

mounted slightly askew. He had no scientific specialty; he was one of the base's military attachés, one of a complement of six.

The cold air seemed to transmit an electric crackle of tension. Pickering stood stiffly at attention, staring up at the group of aliens. Norden tried to picture him swaggering into town, cavalierly crossing the threshold of the temple at the very moment the seldom-seen purifying rays of the sun were about to strike it, then contemptuously unpacking and eating his lunch in this most sacred of Leeminorran sanctuaries.

It had been an outrage. And Pickering looked hardly contrite as he stood in the whistling wind, jaw set tightly, arms stiff at his sides.

"At ease, lieutenant," Norden said.

Pickering sullenly let his shoulders slump, his feet slip apart.

"Pickering, I'm placing you in the custody of this group of Leeminorrans. The man in charge is Ahruntinok, who was appointed Guardian of the Truth by the Overman of Irkhiq. Roughly speaking, he's the prosecuting attorney. This gentleman here is Mahrlek, the Grand Judge who'll try your case."

"Yes, sir," Pickering said tonelessly.

"The trial will be held tomorrow. I'll be present at it, lieutenant. I've reported details of this case to Director Thornton on Earth."

Norden glanced at the aliens. "He's in your hands. What time does the trial begin?"

"Be there at sunup," Ahruntinok said, "if you wish to be present."

Sunup—and, for the second time in history, a human's life lay in the hands of an alien court of law.

Norden had risen at sunup every day of his adult life; this was no exception. The thermometer showed twenty-four degrees; dawn was breaking over the wall of mountains to the distant east.

He dressed rapidly. The men who were accompanying him had been picked the night before, their names posted on the camp bulletin board; they were dressed and ready early, and Norden saw them gathered round a jeep in the middle of the compound, waiting for him.

A quick splash of depilator took care of his stubbly face. He adjusted his uniform, glanced at his watch, and signaled through the window that he was on his way out.

They made the trip virtually in silence, down the winding rutted road that led from the Terran camp to the village of Irkhiq. There were six in the car; Sergeant Heong drove, and along with Norden came anthropologist Gomez, linguist Reilly, Lieutenant Thomas of the Military Wing staff, and Technical Assistant Lennon.

The eight-mile trip ended, finally; the jeep turned off into the broad road that led through town to the temple. The streets were deserted all the way—and for good reason, Norden saw, as they came within sight

of the centrally-located temple; the entire village had come out as advertised to see the trial. Three thousand of them, packed tightly together in the square that faced Irkhiq's temple.

The temple was a blocky unpretty building perhaps a hundred feet high, surmounted by an off-center spire. Architecture on Leminorr had never amounted to much. The temple opened out on a wide courtyard, and three great stone steps gave access to the inner areas. It was on those steps that Pickering had allegedly blasphemed and committed sacrilege, and it was on those steps that he was being tried.

No one occupied the courtyard behind the steps. The temple was polluted, and until the purification ceremonies were complete no public services could be held there.

Pickering stood between two towering Leeminorran guards. He was still in his uniform—it looked as if he'd slept in it, or if he hadn't been to sleep at all. He needed a shave. His dark craggy face was scowling, but he remained stiffly at attention; his guards were armed with drawn wide-bladed krisses, and they looked willing to use them at any provocation. Both of them topped seven feet. Pickering was oddly dwarfed between them.

Fanning out to the accused man's right and left were two files of bright-clad priests; back of them stood civil police and local functionaries. Three Leeminorrans sat in a little triangle facing Pickering, in

an open space some twenty feet square. At the foremost vertex of the triangle sat Mahrlek, the Grand Judge; behind him and to the left was Ahruntinok, Guardian of the Truth, and next to him, resplendent in his robes of state, was the immense figure of Him, the nameless priest-king, the village Overman—He who gave up his name when he assumed His exalted rank, lest demons learn the true name of the Overman and work harm to the village.

The Earthmen rode their jeep as far as possible toward the temple; when the assembled crowd grew too thick to allow further progress, Norden said, "We'd better get out and walk," and they did.

The throng seemed to melt away on both sides of them as they marched single-file inward toward the temple steps. Passing between the rows of huge aliens was like walking through a field of corn in late summer; even the women were six-footers and better.

They reached the trial area. The trio in the clearing sat quite motionless; Pickering might have been a statue on the temple steps.

Suddenly the Overman rose and spread his arms wide, upward, encompassing the entire group, it seemed. When he spoke, his voice was a pealing basso that rolled out over their heads and seemed to crash against the mountain wall that ringed in the entire Irkhiq district.

*"Children of light
Those of darkness
Attend here this day
To see justice done.
That which is wrong
Will be made right
That which is soiled
Will be made clean.
Begin."*

When the final harsh syllable of the invocation had died away, Ahruntinok rose. The Guardian of the Truth was nearly the size of the Overman, but he lacked the awesome presence of the other. He said, simply, "The man from beyond the skies has blasphemed. We gather here today to pass sentence on him, to offer him to justice, to cleanse the temple. The white light of justice will prevail."

At Norden's side, Lieutenant Thomas whispered, "I thought this was supposed to be a *trial*, sir. The way these guys are acting, Pickering's guilt's a matter of common knowledge, and they're here to pass sentence!"

Norden nodded. "I'm aware of that, lieutenant. Leeminorran law isn't necessarily the same as Earth's. But don't worry."

The two files of priests burst into an antiphony now, the right-hand side giving forth a melismatic line of verse, the left-hand side picking it up on the fourth accented syllable and repeating it. It was not quite singing, not quite speech—an elaborate *sprechstimme* that continued for nearly five minutes in close harmony. Pickering stood frozen as the waves

of sound washed over him from right and left, as if bathing him.

The prayer ended. Ahruntinok rose again and recited an account of Pickering's crime, phrasing it in a highly inflected antique manner that was probably the legal dialect on Leeminorr. Norden followed it, but with difficulty; if he had not already been familiar with the facts in the case, he might have been hard put to understand what the Guardian of the Truth was saying.

When Ahruntinok was finished the choir of priests responded with another chanted prayer—a monody this time, slow and grave, building to a moody introverted series of minor-key ejaculations. Norden was glad he had ordered Heong to carry a pocket recorder; in all probability this would be their only chance to record this form of Leeminorran musical art.

Norden glanced at his watch. It was 0800—the trial had been proceeding for more than an hour now—and still not a word had been said in Pickering's defense. The Leeminorran concept of legal form was surprising, but not overly so. This was a rugged people; an offender caught in the act was due for a rugged trial.

For a third time Ahruntinok rose. This time the Guardian of the Truth reviewed the nature of Pickering's offense in five or six terse sentences—for the benefit of the villagers, Norden thought, or perhaps for the benefit of us—and then stepped for-

ward until he was no more than half a dozen feet from the motionless Pickering.

"The temple must be purified. The crime of blasphemy must be washed away. The demon must be driven from this man who stands on the temple steps.

"Prayers and incense will purify the temple. Prayers and incense will cleanse the village of blasphemy. But only the whip will drive out a demon!"

The priests echoed Ahruntinok's last three sentences. It sounded to Norden like nothing so much as a big scene from "Aida"—one where Rhadames stands accused. Obviously the "trial" had been carefully rehearsed.

The villagers took it up next. *"Prayers and incense will purify the temple! Prayers and incense will cleanse the village of blasphemy! But only the whip will drive out a demon!"*

Norden glanced at Pickering. The condemned man was utterly emotionless; his jaw was set, his lips clamped, as he listened to the exulting outcry.

Ahruntinok said, "I call now upon the Grand Judge of the village of Irkhiq."

Mahrlek rose.

The old man stepped forward into the place vacated by Ahruntinok. He waited—one minute, two, until the tension drew so tight the ground seemed ready to split under the strain. Finally he lifted his hands overhead, holding them rock-steady,

and brought them swiftly down.

A shout went up from the populace.

Mahrlek said, "The temple must be purified. The blasphemy must be driven from the air of the village. He who is possessed by a demon must be cured. Let the demon be exorcized. Let the Earthman be driven once around the village boundaries by men with whips."

Norden felt Lieutenant Thomas nudge him sharply. "Sir, that's murder! They'll whip him to death!"

"Quiet," Norden whispered.

Pickering was staring stonily forward. There was even the beginning of a smile on his face.

Norden held his breath. He had coached Pickering well for this moment; if only they had the ritual down straight—!

In a quiet but authoritative voice Pickering said, "I swear by the sun and the sky, by the mountains and by the snow, that there is no demon in me."

His statement was followed by a sudden moment of shocked silence—broken by an awed gasp of astonishment that became thunderous when multiplied by three thousand throats.

Ahruntinok was on his feet again, his face purpling; all the Guardian of the Truth's calm of a moment before had vanished. "Impossible! Impossible! How can he make such an oath? How can a demon-possessed one swear by the holy and blessed?"

The chorus of priests had disin-

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tegrated into a knot of argumentative theologians. A hot buzz of comment drifted from them. Norden smiled in relief; it had gone across, then. The paradox had been hurled forth.

They were all on their feet now—the Overman, the Grand Judge, Ah-runtinok—staring at Pickering. The guards at Pickering's sides tightened their grips on their blades, but superstitiously moved several feet away.

The Grand Judge advanced on wobbly legs. He detached the jewel-encrusted cowl he wore round his neck and extended it nape-first to Pickering.

"Touch your hands to this and repeat what you just said," Mahrlek ordered in a quavering voice.

Pickering smiled bleakly, grasped the Cowl of Justice, and repeated his statement. The old judge ripped the cowl away and hastily tottered back.

Utter confusion prevailed in the trial area. Norden had chosen his steps wisely. He picked this moment to come forward, jostling his way through the horde of openmouthed villagers, and entered the cleared area.

"As leader of the Earthmen I claim the right to speak on this matter here and now!"

He glanced in appeal at the Overman.

"Speak," the Overman said hoarsely.

"You have given my man trial by your own ways, and you find he is possessed by a demon. But the oath he has just sworn is one no demon could swear. Is this right?"

The trio of Leeminorrans nodded reluctantly.

"The court is thus in doubt. According to your own law, there is only one way this case may be settled now. I call for that method!"

The aliens exchanged glances. "The trial by combat?" Mahrlek asked querulously.

"Yes," Norden said. "The trial by combat, with Pickering fighting the Guardian of the Truth to determine where justice truly lies in this matter!"

The Overman laughed—a welling crescendo of ironic amusement. His face dissolved into a hundred wrinkling laugh-lines; his big body shook.

"Your man—against Ahruntinok?"

"Yes," Norden said.

The Overman gestured, and Ah-runtinok crossed the clearing to stand facing Pickering. The Guardian of the Truth was six inches taller than the Earthman, and at least a hundred pounds heavier.

"This is amusing," the Overman said. "But justice must be served. Your choice of weapons?"

"Bare hands," Norden said. "Body against body. Fist against fist."

He looked at Pickering, who merely nodded slightly without otherwise indicating reaction.

"Body against body," the Overman repeated. "Fist against fist."

The Grand Judge said, "It will be the simplest way. The Earthman is mad; this will demonstrate it. And the law calls for such a thing."

For a moment the Overman seem-

ed deep in thought; he stood facing Norden like a slumbering volcano, brooding, eyes turned inward. After a long pause he said, "So be it. Ah-runtinok will combat with the Earthman Pickering—naked, on the gaming-ground of Mount Zcharlaad. Justice will be served. The defeat of the Earthman will serve to purify and cleanse us. And then we can drive forth the demon who confuses our trial and bedevils us all."

He pointed toward the Guardian of the Truth. "Ah-runtinok, is this trial agreeable to you?"

Ahruntinok grinned. "I welcome it."

"And to you, Earthman?"

Pickering shrugged. "I'll fight him," he said, without altering his sullen expression.

"It is decreed, then." The Overman turned to face the throng. "We shall adjourn to the gaming-ground of Mount Zcharlaad!"

It took nearly half an hour for the crowd to disperse. Norden, Pickering, the three high Leeminorrans, and the five other Earthmen, remained in a loose grouping around the temple steps, waiting for the mob to break up.

Little was said. The aliens exchanged a few puzzled whispers, but Norden was unable to hear what they were saying. He could bet on it, though: they were wondering how Pickering had been able to confound their theology so thoroughly. Obviously he was demon-possessed, or else he would never have committed

his acts of sacrilege—but yet, no demon could have sworn innocence on the cowl of the Grand Judge. It made no sense. Trial by combat was the simplest solution. If Ah-runtinok trounced the Earthman, as seemed most likely, then Pickering was guilty of malicious and deliberate acts against the Leeminorran religion, and the beating he would get from Ah-runtinok would be ample punishment. But if Pickering should win—

Norden guessed that the Leeminorrans preferred not to speculate about *that* possibility.

He waited, saying nothing. Pickering stood between his two guards, unsmiling. Finally the time to depart came.

Norden left Pickering behind in custody of the aliens, since he was still nominally a prisoner of theirs. He led the way back to the jeep and they piled in, Heong behind the wheel.

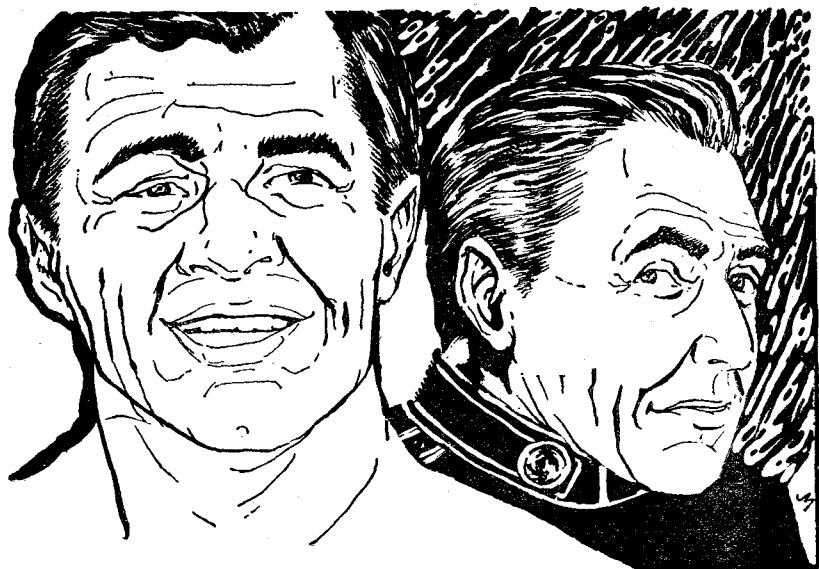
As the turbos thrummed into life, Lieutenant Thomas, the Military Wing attaché, swiveled round to look at Norden, who sat in the back.

"Sir?"

"What is it, lieutenant?"

"Would you mind explaining the facets of this trial to me? I'm afraid I got lost six or seven turns back, when the prosecuting attorney was still yowling for Pickering's scalp. How come you stepped in and demanded this trial by combat thing?"

The lieutenant was red-faced; he was acutely conscious, evidently, that he was the only man in the jeep without formal scientific training, and



it was rough on him to sit there with his ignorance showing.

Norden said, "Would you have preferred it if I'd kept quiet and let them whip Pickering to death?"

"No, sir . . . but . . . sir, it's just as bad this way! That alien must be six foot ten, six-eleven, and close to four hundred pounds. It'll be slaughter, sir!"

"You think so? Watch, then," Norden said, grinning. "Pickering's no midget at six-four."

"He is, next to that boy, sir!"

"You watch, lieutenant. I think I know what I'm doing."

There wasn't much that could be said after that. Norden sat quietly, staring through the jeep window at the steadily more forbidding landscape; they were rising through some

rocky country now, following the broad back of a large Leeminorran vehicle bulging with townspeople. The Leeminorrans still used internal-combustion engines for their cars; it made an unholy racket.

They wound upward along the mountain path; up here, the ground was covered with a thick layer of snow, and a vicious wind whined down from the sawtooth crests of the upjutting unforested mountains. It was hard to believe that this was Leeminorran summer; in the winter, in this continent, temperatures rarely rose above freezing, and in the mountains the thermometer stayed between zero and eighty or ninety below for nine months of the year . . . getting as "warm" as freezing for a brief hot spell in mid summer.

Norden reviewed the steps of the trial in his mind. His report would need to be done with care; it was going to be a document given to every Corps trainee to read, along with Colonel Devall's report that preceded it. The reports would make an interesting pair side by side, he thought.

The Norden Precedent. He liked the sound of that.

He smiled. There would be plenty of theological discussing going on tonight in the village of Irkhiq, he thought. Plenty.

In fact, it was going to take more than one evening to get everything straightened around, theologically. The Leeminorrans might even need a brand-new theology before Norden got through with them.

The gaming-ground of Mount Zcharlaad was a broad plateaulike area set in an outstretched arm of the sprawling mountain, at an elevation of perhaps five thousand feet. Norden was grateful for that; much higher up, it might have been too rough on Pickering.

A natural amphitheater ringed the site, a shell-like rise in the rock into which seats had been hewn. Now, the villagers filed slowly into the seats. A layer of snow covered the gaming-ground itself, and a bitter wind sliced downward from the higher reaches of the mountain chain.

Pickering did not look worried. He stamped his feet a few times against the cold, but otherwise seemed calm, almost *too* calm. It might

have been a fatalistic numbness, Norden thought.

Ahruntinok looked elated. The big alien had already stripped down to his fighting costume—a pair of woven briefs and sandallike buskins—and was loosening up, flexing his huge muscles, swaggering around the outside of the ring, clenching and unclenching his fists. The cold hardly bothered him. His dull-blue skin was glowing healthily, and his features were animated. Norden wondered how many times Ahruntinok had fought here in the gaming-grounds; not a few, he supposed.

The Grand Judge and the Overman stood silently to Norden's side. Their faces revealed little of any thought-patterns behind them.

"When does it start?" Norden asked finally.

"Soon," the Grand Judge said. He pointed to the tiny dot that was the sun, hovering just above the crests of the mountains, and said, "The time is not yet right. A few moments more. A few moments more."

Norden walked over to Pickering. "All set, lieutenant? Feeling all right?"

"Fine, sir."

"The cold won't bother you, now?"

"It may slow me up a little. I'm not worried about it, sir. I can manage."

"I hope so," Norden said. He glanced up at the big man—who seemed so strangely dwarfed by the towering Leeminorrans—and grinned. "Good luck, Pickering."

"Thanks, sir."

The Grand Judge signaled. It was time for the bout to begin.

He stepped forward. In a surprisingly ringing voice, old Mahrlek announced, "Justice now will be served. Ahruntinok, Guardian of the Truth, will meet in combat the Earthman Pickering."

Priests stationed in the first row of seats set up a wailing ululation of a chant. *Ahruntinok's cheerleaders, no doubt*, Norden thought.

Pickering stripped down to fighting costume—shorts and boots, nothing else. No tape on the fists, no gloves, no masks. Just two naked men against each other, in forty-degree weather, with no holds barred. *Justice will be served here today.*

The priestly chanting reached a wild climax, tenors and basses shrieking in utter atonal discordancy on the final three notes.

Then the gaming-grounds became very silent.

"Justice will be served," said the Grand Judge in solemn, sententious tones.

The fighters stepped forward.

Ahruntinok gleamed with oil; his hairless body shone in the faint sunlight, and his muscles stood out against his sleek skin in sharp relief. He was grinning, showing his mouthful of spadeshaped teeth; he stepped toward the center of the gaming area with a wide rolling walk, like a sailor heading downship in a fierce storm.

Pickering was in the center already, and waiting, poised. His un-

anointed body had little of Ahruntinok's glamor; he looked too pale, too hairy, too squat and clumsy next to the Guardian of the Truth. Ahruntinok moved with the grace of a well-oiled killing machine; Pickering, with the awkward ponderous motions of an ancient tank. The only sound was the whistling of the wind.

Ahruntinok broke the silence with three quick grunted guttural syllables—a challenge perhaps, or an invocation, a prayer. Pickering remained silent.

Arms wide, Ahruntinok moved forward.

Norden saw the strategy at once. Ahruntinok intended to make the most efficient use of his half-foot advantage in size and reach, and of his great weight. He was going to hug Pickering to him, draw the Earthman into a bearlike grip and squeeze him into unconsciousness or death.

Ahruntinok's red-rimmed eyes flashed savagely. He advanced toward Pickering, reaching out to gather the Earthman in.

But Pickering had other ideas. He danced forward into the spreading hoop of Ahruntinok's arms and smashed a fist upward at the square chin of the Guardian of the Truth; then he spun away, quickly, slipping beneath the big alien's guard.

Ahruntinok bellowed in anger and whirled on Pickering. A second time the Earthman tiptoed forward and landed a punch, skipping away un-

touched. Murmurs began to pass through the watching crowd.

The alien had shown no ill effects as a result of Pickering's two punches, but he was angry. He thundered toward the Earthman now, arms flailing, huge fists whistling through the air. Pickering easily avoided one wild swing that would have been fatal had it landed, and cracked his left fist into Ahruntinok's exposed belly. A gust of air escaped from the alien's mouth.

Ahruntinok howled. The warrior's nobility was gone, now; he reached out desperately with clawed fingertips and managed to scratch six red lines down Pickering's shoulder—but at the same time the Earthman casually slapped an open-handed blow at Ahruntinok's mouth, and a dribble of red blood trickled forth, running down the alien's chin.

Now the crowd was silent again—*frightened* silent.

Pickering exhaled a cloud of white fog and called out to the alien. Ahruntinok whirled; Pickering hit him with a sharp left to the heart, followed with a savagely aimed right smash that sent Ahruntinok's head snapping back.

Norden, at the sidelines, felt a sudden burst of exultation.

The bigger they are, he thought—

Ahruntinok was utterly disorganized. He had never been able to get his superb body unhooked and ready for action; Pickering now seemed all about him, lashing him with blows from every direction at once. Ahruntinok was growling angrily, send-

ing panicky swipes in hopes of felling Pickering with a sudden blow, but he was unable to land any.

Pickering was everywhere. The six-inch height differential mattered very little now. One of Ahruntinok's eyes was swelling shut, now; the other was bruised. The alien's thin lips were split. Sweat washed down his massive shoulders and back, mixed with blood.

Ahruntinok was a wrestler, and a fine one. But the first rule of wrestling is that you have to get hold of your man before you can do any damage to him. And Pickering moved too quickly for that.

Ahruntinok was turning in circles, howling like a blinded Polyphemus, imploring Pickering to come within range of his crushing grip. Pickering did—just long enough to detonate an uprising right off the point of Ahruntinok's chin. The giant wobbled; Pickering lifted another from the floor and Ahruntinok staggered forward, still conscious, blood and spittle foaming from his mouth.

Norden glanced at the Overman. He looked sick.

Ahruntinok dropped wearily to his knees and straggled toward Pickering, groping for him. Pickering ran forward and slapped Ahruntinok twice, fast, to keep him conscious a while longer. The alien rocked and tried to take his feet again; Pickering grabbed one of Ahruntinok's arms and whipped it up suddenly behind the giant's back.

Norden wondered if they'd invented the half nelson on Leemi-

norr. If they hadn't, they were in for an enlightening now.

With his free arm Ahruntinok vainly tried to catch hold of Pickering, who stood just behind him. Pickering proved uncatchable. He bent Ahruntinok's arm higher, higher, holding it now in an unbreakable grip.

Norden had never heard three thousand more silent people in his life.

Pickering was grinning savagely now. Norden saw that he had absorbed a few bruises in the contest himself; one lip was puffy, and his left ear was swollen. But generally he seemed in good shape. He yanked Ahruntinok's arm up. The giant grunted.

A single loud *crack!* resounded over the gaming-grounds.

Pickering released Ahruntinok's suddenly limp arm and stood back as the giant writhed in pain, knotting his huge legs as if wishing he had Pickering's neck imprisoned between his tightening thighs. Pickering grasped Ahruntinok's other arm and glanced questioningly at Norden.

Norden shook his head.

"No," he said in English. "Enough's enough. Don't break the other one."

Pickering looked disappointed, but he let Ahruntinok's arm drop, and stepped back. The giant lay huddled face down on the hard snow, still conscious but not moving. His great body was racked by three loud, bitter, bewildered sobs. He made no attempt to rise.

... *The harder they fall*, Norden thought.

Pickering was coming off the battlefield now. He was gasping hard for breath, and his skin was blue and goose-pimpled from the cold, but he was traveling under his own steam without trouble. He crossed the field, drew near the Overman and the Grand Judge, and sank to the ground at their feet.

Kneeling, he looked up at the Overman and repeated the words Norden had taught him.

"My lord, I ask forgiveness for what I've done. The guilt of blasphemy lies on me still. Will you deign to punish me?"

If Pickering had struck him in the face, the Overman could not have looked more astonished. Mouth open, he stared from the huddled figure of Ahruntinok lying alone in the center of the gaming-ground to the kneeling figure of Pickering. In a hesitant, surprisingly small voice he said, "Punish you? The trial is over, and you have won. How can we punish you now?"

"I insist, my lord. I blasphemed at your temple."

Norden forced back a grin at the Overman's discomfiture. The pickering was looking at the Grand Judge as if expecting some answer, some way out of this dilemma: how could Pickering have committed blasphemy if the result of the trial-by-combat showed clearly he was innocent? There had been a hundred witnesses to his act. How—?

The Grand Judge, of course, had no answer.

Norden stepped forward. It was not part of his plan to humiliate the Overman before all his village.

He said, "The man is clearly innocent by your law. I ask your permission to take him back, to settle his case among ourselves. May we have him? Will you release him from your custody?"

Something similar to horror passed over the Overman's face. "Yes," he said, much too quickly. "The man's yours. The matter's ended, so far as we're concerned. Take him! Take him!"

But the matter, of course, was far from ended so far as the Leeminorans were concerned. Their troubles, Norden thought, were just beginning.

He stared at the solidophoned figure of Director Thornton and said, "I did the same thing Devall did, sir. One of my men committed a crime against their laws, they came to me to demand him for trial, and I handed him over to them. You have to admit I was perfectly fair-minded about it."

"You were," Thornton chuckled. "Clean and aboveboard in the dirtiest way possible."

"I object! Just because I hand-picked my criminal, and just because he *deliberately* committed blasphemy in the most open and casual manner, and just because I knew that Leeminorran law provided recourse to trial

by combat if the accused man requested it—"

"... And just because your man Pickering just happened to be one of Earth's most murderous professional boxers," Thornton added—

"Well? The job got done, didn't it?" Norden demanded.

"It did indeed. And very well, too, according to your report. There'll be a commendation for you, Norden. And when you're through with Leeminorr, I'll try to find a less wintry world for your next stop. Seems to me you've had a succession of rough assignments."

"I like it that way, sir," Norden said quietly.

"But—"

"Sir?"

That was all he needed to say.

Later, as he sat alone in his room filling out the routine report on the weather for that day, he paused to think over what he had done.

He felt pretty good about it. He had come to Leeminorr with a purpose, and he had fulfilled that purpose.

He scribbled busily away. *Fifth September 2709. Colonel Lorne Norden reporting. Eighteenth day of our stay on Leeminorr, World 5 of System 2279-sub-c. Morning temperature 23 at 0700—*

The Corps, he thought, had been saddled by the Devall Precedent. When an Earthman commits a crime on an alien world where he's part of a study team, he's responsible to the inhabitants of that world.

Devall had been an intelligent

man, but a fuzzy thinker. His line of reasoning was down in his report: *I believed I should treat the aliens as equals, and the best way to prove this equality to them was to subject ourselves to their legal code.*

That was all well and good, thought Norden, as he continued working. There was only one minor hitch: the aliens were *not* equal. It was sloppy-minded to insist that they were.

The Markins had used trial by ordeal; the Leeminorrans, trial by combat. Both good systems, in their day—but not the best. Their results had little to do with actual justice, much as their proponents thought they did.

Norden had fought a double battle, and had won both. He had effectively smashed the Devall Precedent, and he had taught the Leeminorrans a few things about justice.

Simple. Just see to it that your man commits a flagrant abuse of the law in the presence of a few hundred witnesses—and then, when they take him away for trial, have him prove his undeniable innocence *by their laws*. Then let them square the problem of how a man can so obviously commit blasphemy and still get away with it at trial.

That ought to shake a couple of their concepts, Norden thought. It ought to show them a thing or two about the effectiveness of trial by combat. And they'll think twice before they hail an Earthman up before their courts again.

He finished writing, closed up, and filed away the log. He walked to the window. Night had fallen; the splinter of moon was overhead, and a light snow was dropping through the cold darkness.

Devall's mistake had been to treat his bunch of aliens as if they were equals, when they really weren't . . . not yet. Norden had shown the Leeminorrans the flaw in the Devall Precedent: if you want to be treated like equals, you have to face the consequences. And the consequences, in this case, proved pretty ugly for poor Ahruntinok.

But he'd recover, and the Leeminorrans would learn something from the incident. Norden smiled.

He liked the sound of it: Norden's Precedent. *If aliens demand equality with Earthmen, give 'em all the equality they can stand, and then some more! Give it to 'em till it hurts!*

That would hold as a good rule of thumb, Norden thought. Until the race came along that really *deserved* equality, and that was a different matter.

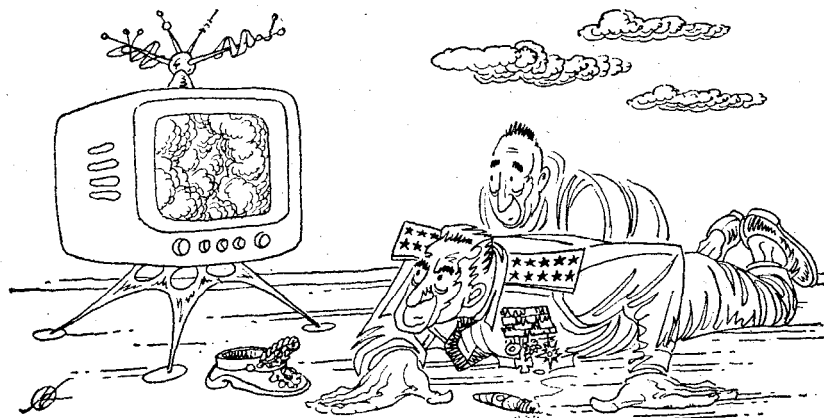
He snapped off the light and headed out into the snow, trotting across the compound to the medical building. The docs were fixing up Pickering, taking the bruises out of him and removing the dent a wild swipe had put in his nose. Pickering had gone through a lot lately, Norden thought. The colonel wanted to congratulate him for a good job, well done.

THE END

PRECEDENT

31

TRUCE...



Illustrated by Freas

.by BOOMERANG

It would put quite a severe limitation on the use of weapons if you were forced to limit yourself to techniques you could take, as well as dish out....

BY CHRISTOPHER ANVIL

Truce Supervisor B. H. Perkins lay hugging the dust as the barrage thundered overhead. The ground trembled beneath him. There was a taste of grit in his mouth and a bone-weariness in his limbs. From somewhere in the distance, a thin cheer reached him. Perkins raised his head and looked out from behind the shattered stub of a tree.

The glare on the sandy earth was blinding, but he saw it. A long column of sand-colored trucks was rumbling forward half-a-mile away. Farther off he could see low clouds of dust churned up by advancing tanks.

Perkins turned his head and saw young Assistant Truce Supervisor Macklin studying the moving column

with an expression of bitterness.

Perkins glanced around. Their jeep was fifteen feet away, where they'd left it when the bombardment opened up. Then the shells had dropped practically down their necks. Now the barrage had lifted and moved forward. Perkins still had his life, if not his truce.

Macklin came to his feet and brushed himself off. "Now what do we do, sir?" he said angrily. "Should we go back and plead with them to take back their bombardment? Or do we go sit in the outer office and beg to be let in for an explanation?"

"That," said Perkins, "is all up to the Secretary General." He got in the jeep. Macklin sat down behind the wheel. They started back toward their headquarters.

On the way, they passed three columns of trucks loaded with troops. They were jeered twice, cheered ironically once. Passing the last column, a spray of bullets went over their heads.

Macklin stared straight ahead. "To do this job right," he said, "a man needs armored skin and the disposition of an angel."

Perkins grunted noncommittally. The trouble, he kept telling himself, was that he had nothing to offer but the *status quo*, and no one here wanted the *status quo*. Call the combatants A and B. Even assuming the two sides could be content with their present borders, how did A know that B would be peaceful five years from now? And how did B know that A would be peaceful twenty

years from now? The *status quo* involved mutual distrust, and that prolonged mutual distrust was what neither side could stand. Neither wanted to live with a bomb at his ear, ticking now loud, now soft, now with a threatening boom and rattle, so neither could ever settle down and look ahead with any assurance.

Perkins' cheeks puffed out as he exhaled sharply. He just didn't see how it could ever be done. To guarantee peace, he needed to intimidate both sides, so that each knew the other would hesitate long before making trouble. And to do that properly, he needed the armed might of one or the other of the two great world powers. Yet, if either of those two powers moved in here, the other would be uneasy to the point where Perkins would need a seventy-two hour day just to keep *them* at peace.

Macklin leaned forward and squinted as the headquarters caravan came into view. Angrily, he said, "As if we didn't have trouble enough already, there's that So-and-So again."

Perkins shifted his position in the bouncing jeep. "Who?"

"I don't know. A correspondent, probably. Some unprepossessing-looking individual who thinks he has the answer to everything and wants to see you."

Perkins scowled. "He's been here before?"

"Several times. I've given orders that he's to be kept out, but he gets in, somehow."

Perkins leaned forward. As they

came closer, he could make out a slight man sitting sidewise in a jeep, with a tarpaulin-covered trailer hooked on behind. Perkins cleared his throat. "I'm going to be busy for the next few hours, as you know. But I want you to send that man in to me at three-thirty."

"Sir, at best he's a correspondent with a bad case of swollen head. At worst, he's a crank."

"You said he thinks he has the answer to everything?"

"Oh, *he* thinks so."

"Then he's a straw," said Perkins, "and in the position we're in, we can't be above grasping at straws."

The day advanced discouragingly. It got hotter and dustier. The rumbling thunder in the distance grew loud and fell away, but never ceased. Heavy bombers roared low overhead. The reports coming in added to the proof that the attack wasn't cumulative, built up out of exasperations that burst loose here and there and spread from place-to-place. It was a fully co-ordinated offensive; the only discordant note, that set Perkins back in his chair, was a series of unexpected reports from a supposedly quiet sector of the boundary. Here, the *other* side had attacked at nearly the same moment, and with such force and effect that this, too, was clearly planned in advance.

Now the question was, who was the aggressor?

If A and B stand glaring at each other, growling mutual threats and insults, then A hits B on the jaw at

the same instant B punches A in the stomach, who started it?

Perkins groaned and looked up to see Macklin, his face pale and gloomy, at the door.

"It's three-thirty, sir," said Macklin.

Perkins frowned, then remembered. "Send him in," he said.

Macklin stepped outside.

A thin, gray-haired man came in and looked at Perkins. After a moment, he said, "I got some stuff for you."

Perkins scowled.

The stranger said, "You want to end the war, don't you?"

"Of course," said Perkins, "but—"

"You'd better give me a hand. Some of it's pretty heavy."

Perkins hesitated, then got up and followed his guest outside. It took twenty minutes to bring in the crates and boxes from the trailer. When they were all stacked up in Perkins' office, the stranger said, "O.K., now leave me alone. I got to put this stuff together."

Perkins, perspiring freely, stood outside the door.

"Sir," said Macklin, looking on, "I'm not sure I understand this at all. Why don't we just have this fellow escorted back to his starting place?"

Perkins looked at Macklin with a faint smile. "There's a great deal of wisdom in old sayings, my boy."

"Sir?"

"Beggars can't be choosers. Position is everything in life. A bird in the hand is worth two in the bush.

A drowning man grasps at straws." Macklin looked a little dazed.

"... All containing a great deal of truth," Perkins went on. "Our purpose here was to prevent fighting. We had a certain moral capital to expend in that direction. Ideally, we would have added to that capital, so that we would have been living, as it were, on the interest. The situation was such that we couldn't do it. We had to live on the principal. Now the principal is very nearly all consumed. I won't say that we're beggars, Macklin, but in this respect we're very close to it. Our position is precarious. Now this gentleman comes to us and asserts that he has the solution. He approaches the problem as a repairman might approach a television receiver that has gone out of order."

"The man's a lunatic," said Macklin.

"Quite possible," said Perkins sadly. "But he's a bird in the hand. And at least he's a sign that we have some moral capital left. He came to us, you see."

Macklin frowned and started to speak.

Overhead, a jet roared, its heavy rumble making them both glance up apprehensively, then look at each other.

The door of Perkins' office opened. "O.K.," said the slight, gray-haired visitor. "It's ready. You can come in now. No," he waved Macklin back. "Just *you*." Perkins came in.

Macklin stepped back angrily.

Perkins closed the door, then turned around.

At first glance, Perkins was inclined to agree with Macklin that the man was a lunatic.

There seemed to be two large television sets face-to-face across the room. There were a number of smaller sets with blank faces ranked on Perkins' desk and chair and set on the floor nearby.

The gray-haired man looked at the apparatus gloomily. "Eight hundred and forty-two tests it took us to find out the thing isn't commercially feasible," he said.

"What *is* this?" Perkins demanded.

The man looked at him. "You've heard of the telephone?" he said sourly.

"Of course," said Perkins scowling.

"Well," said his guest, "some bright guy got the idea if we could send a voice over the wires, we could do it through empty space, using a carrier wave instead of a wire."

"Radio," frowned Perkins.

"Yeah. Radio. It worked. It turned into big business. And some guy sent *printing* over wires—teletype. And pictures—telephoto. And then, the idea was, send pictures without wires. Television. What a big business *that* turned into." He looked sourly at the assemblage in the room. "It was only natural somebody would think of this."

"I don't doubt it," said Perkins.

"That's all very true. But what *is* this?"

"Matter transceiver," said his guest sourly.

"*Matter* transceiver?"

"That's right. Now, let me show you. London and New York are practically the same height above the center of the earth. No work has to be done against gravity to *raise* a package from New York to London. If a frictionless surface stretched from one to the other we could give a hard push at one end, the package would slide across the Atlantic and deliver up the hard push when it hit London on the other side."

Perkins goggled. "See here—"

His guest waved him silent. "Nearly all the trouble getting across the Atlantic comes from what amounts to so much friction. Shoving a ship through water is work. Millions of tons of water move to the right and the left and then back again as the ship goes by. You've got a track of turbulence and waste thousands of miles long. With an airplane, you've got the added work of holding the plane up against gravity all that time. You see what I mean? It's wasteful."

"Yes," said Perkins. "I'll concede that. But what does that have to do with us, here?"

Perkins' thin, gray-haired visitor looked sourly at the apparatus. "The idea was to transmit electromagnetically. 'There's no friction in radio waves,' as the boys used to say." He looked sharply at Perkins. "Do you think you could yell loud enough

to be heard across the Atlantic?"

"Certainly not," said Perkins, startled.

"But you could yell into a microphone, have the pattern of your voice carried across the Atlantic as a radio wave, and your yell will come out a receiver on the other side before it could travel across the room under its own power. All right, the idea was to do the same thing with objects." He grew a little excited. "Think of the possibilities! The market would be world-wide. Shipping delays and spoilage cut to almost nothing." The gloom returned to his face.

Perkins, studying him with a frown, glanced at the apparatus curiously. "Hm-m-m," he said. He looked back at his guest. "Didn't it work?"

"Oh, after a fashion. We sent a block of lead two hundred miles and back and thought we had it licked. All we had to do was iron out the bugs. While we were doing that, someone even figured out a way to send and receive from the same instrument, to anywhere else in range. Meanwhile, we had refined the apparatus, and re-refined it, and refined it again, and it finally dawned on us that the bugs were built-in." He walked over to the nearest set and snapped it on.

Perkins blinked.

The desert stared out of the screen, bright and hot. Miniature tanks were grinding forward in a haze of dust and smoke. Their guns flared, and

the roar of the explosions came as from a distance into the room. The picture was clear and detailed, and did not flicker at all. It was like looking through a hole into the desert itself.

"Incredible," said Perkins.

"Oh, it's great," said his guest sourly. "Now just try and *smell* that dust and smoke." He adjusted the set till the roar was deafening, and the muzzle of a hammering gun seemed less than ten feet away. Then he quickly readjusted it to a distant view, wiped his forehead, and looked up. "Smell anything?"

"I— No. I couldn't be sure, but I don't think so. The illusion was very convincing, other than that."

"Sure. It looks good. It sounds good. But there's a skin effect. Here. Put your hand in."

"I'll break the screen."

"No, you won't."

Perkins scowled, and reached cautiously toward the face of the receiver. Where he expected to touch the screen, he felt nothing but warmth. Frowning, he reached farther. There was a faint elastic resistance, and he pressed carefully against it. His arm went farther and farther into the set, feeling the warmth and the sunlight, and a sensation like that of a hand pressed into the side of a large, partially inflated balloon. Now, he expected to feel the back of the set. He moved forward, and suddenly he saw the other side of the set, and his arm wasn't there. He jumped back.

Now his arm was all right.

"Look here," he said. "What happened?"

"You reached through, into that space shown on the 'screen.' Or *almost* through. There's that skin effect I told you about."

"Do you mean, I could reach in there and *drop* something, and it would land in the desert?"

"No. It would be held right next to your hand when you tried to drop it. And when you pulled your hand back, it would fall out in the room here. The skin effect."

"I could feel the heat of the sun plainly."

"Sure, radiations go through all right. But not even anything as small as molecules can get through that skin unless they have high enough velocities and a long enough mean free path. That's why no odors get through."

"I don't follow."

"You can't *drop* a bullet through. But if you aimed a gun in there, you could *shoot* it through. You have to break through that skin or what you're trying to put through comes right back out again."

"Oh, I see. That was why you couldn't use it for . . . ah . . . matter transference?"

"That's half of it. We'd have had to pack the goods in artillery shells and shoot them through. But there's something worse yet."

"What's that?"

"There's a random distortion brought about by the circuit itself. We thought it was defective equipment, but we finally traced it back

to the uncertainty principle. There isn't much we can do about that. If you send a watch through, it may or may not run when you take it out the other side. If you send cheese, it may have a slight off-flavor. A solid piece of lead, say, will change its shape slightly." He looked closely at Perkins. "Of course, if it's a bullet, that won't matter much."

Perkins looked back uneasily. "All this is of interest, no doubt, but what does it have to do with what's going on outside? And why are you here? Your interests, I judge, are purely mercantile."

His guest smiled and shook his head. "This is how you can *end* what's going on outside. As for what I'm doing here—I was sent. Somebody had to get it to you, and we wanted to try it out on the spot."

"But—why?"

"To make sure it worked. We want to end this war. Wars can spread, you know. And you can't do business in a crater."

"Fine, but— Look here. We have no need for this splendid equipment." Perkins gestured toward the machine. "Observation. This would be wonderful for observation. But, we're beyond that, don't you see?"

"You don't get it?" said his guest sadly. "I explained to you this is a *transceiver*." He walked resignedly to the set, adjusted it slightly, and said, "Go over there where you can't see it. Back there. Get in back of it." When Perkins had followed instructions, his guest got down on the floor, reached up cautiously, and

moved one of the controls. The thunder of big guns grew loud in the room, was joined by the mutter and cough of engines, and the whine of bullets. There was a burst from a machine gun, then another.

Abruptly, a line of holes appeared in the door and one wall of the room.

The thunder and crash receded.

Perkins stared at the holes.

"I told you," said his guest. "Skin effect. This is a transceiver. It makes a two-way connection and those bullets were coming in the right direction fast enough to get through."

Perkins wiped his forehead. He felt the glimmering of an idea starting to form. He glanced at the two big sets face-to-face.

His guest nodded approvingly.

Perkins thought, what each side needed was positive assurance the other side wouldn't start anything now or several years from now. Assurance that it would be deadly to start anything. In that way, each could relax; in time, good feeling might even have a chance to develop. In time— But *how*—

His guest walked over and spun around one of the big sets. He flicked it on and practically the same picture appeared as on the smaller set. He swung it back and locked it in place.

"The way it usually works out," he said, "soldiers don't start wars. Dictators start them. Cabinets start them. There's pressure of some kind and the war comes for emotional or

political reasons. War is horrible today. That generally comes home as soon as anyone realizes *he* might have to fight the war. Then we get an inrush of cold common sense. The idea is, how to bring this common sense to the dictator, or the cabinet, so they don't see the war as an abstract symbol, but as solid bullets that may hit *them* any time."

He snapped on a second set, and there stood a famous figure studying a map. The famous man moved his hand here, and here. Assistants were rearranging pins on the map as he talked rapidly and earnestly with subordinates. The subordinates nodded. Orders were urgently repeated over phones. On the map, symbols moved, showing the general direction of massive forces approaching the battle area. A complex problem with many parts to be co-ordinated.

On the other set, tanks were burning. A man lying on the ground nearby was turning over in pain, his hand clenched over his face.

Perkins glanced from one scene to the other. The calm planner. The soldier in agony. "Horrible," he said.

"Isn't it? And for the time being, all that violence and suffering is just a symbol to the first man."

"Will this screen project an image directly into that one? Could we make him *see* the suffering?"

"Yes. We could."

"Still," said Perkins hesitantly, "people can become immune to the sufferings of others."

"If they're around it all the time,

sure. If it flashes on them suddenly in normal surroundings, then disappears and comes back unexpectedly, that's different. But there's a more direct way—"

"What's that?" said Perkins.

His guest motioned him to the back of the room. He carefully readjusted the screens and stepped aside. He dove for the floor. The roar of guns and the whine of bullets filled the room. Bright flashes lit the far wall. Abruptly the roar was cut back, and Perkins hurried to look in the screens.

In one was the flash of a far-off battle.

In the other stood the famous figure, surrounded by frozen aides; the upper section of the wall nearby was pitted with holes sifting dust and plaster onto the floor.

Perkins whispered to his guest, "Is this two-way reception now?"

"Not on that screen. That's just receiving. But I can fix it."

"What will he see if you do?"

"Just as much as you see of him now, but not framed in a receiving set. It will be as if these two rooms were connected by a hole. Light and sound can pass through. You could even shake hands as if through an invisible rubber sheet."

On the screen, the famous figure was beginning to turn slowly. His aides moved their hands as if on rigid vertical pivots.

"Fix it," whispered Perkins.

The famous man's Adam's apple moved up and down. He stiffened

his jaw and slowly turned farther around.

Perkins looked at him sternly.

Their eyes met.

"You broke the truce," said Perkins accusingly.

The face opposite him blinked, moved cautiously this way and that, as if trying to get things into focus.

"You must," said Perkins, his eyes narrowed, "withdraw your troops back of the boundary. Precise details will be settled in a radiogram I shall send you shortly. But the fighting must be completely ended by midnight tonight. Do you understand that?"

The well-known figure turned slowly and looked up at the wall behind him. As he watched, a piece of plaster near the ceiling gradually sagged and fell to the floor. Something embedded in the wall glinted dully, and he turned back toward Perkins.

Perkins looked at him coldly and unblinkingly and said nothing.

At length, the famous man cleared his throat. His voice a hoarse level whisper, he said, "All right. But see that *they* do the same."

Perkins inclined his head slightly. The scene vanished. Perkins looked at his guest and suddenly felt himself grinning. "And now," he said, "for the other side."

"Right." His guest was bent over the controls and looked up. "The angle of contact adjustments have to be made carefully. A martyr at this stage could cause trouble."

Perkins nodded and watched him make the adjustments.

This time there was speedy agreement, a halting flood of questions, and a faint baffled look of craft and determination. When it was over, Perkins said, "Now what?"

"Now after I get more equipment, I teach you how to operate this stuff. You can use it as transmitter, receiver, transceiver, and you have to know where to use which. And it's important to know how to make the settings quickly."

"I wonder if this will all work according to schedule," said Perkins thoughtfully. "There was a faint look of craft on the face of one of our principals."

"Oh, there's no predicting," said his guest. "In this age, people are likely to react fast to miracles. Maybe by tomorrow they'll have the nominal authority divided up into sixteen buck-passing committees. But in war, the authority has to center somewhere, and that is where to use this.

"At worst, things will get so complicated for them that they'll have to call off the war or go crazy. There are better ways for a man to spend his energy than planning or fighting a war. We just have to make that clearer."

Perkins looked at the apparatus. "What if there's a raid to capture this?"

"With practice, you can use these to put up an effective defense." He scowled. "But don't worry, we're covering you from a distance. We

have a great many more of these defective apparatuses."

Perkins held out his hand. "I don't know how to thank you; I'll do the best I can."

"I'll bring you more of these. You've got to get men you can trust to operate them."

"I'll get them."

"Good. Eventually, we'll solve our original problem, and that should finally bring men close enough together so we'll have an end to these troubles." He turned to leave.

"I wish you luck," said Perkins.

His visitor turned and smiled for the first time. "Oh, we're making some progress. We've got a light-duty pilot model of a new design going. It takes too much energy, but it has possibilities." He opened the door and strode out.

Macklin and two others were standing blank-faced outside the door.

"I'm sorry," said Macklin. "We heard the noise and came running. It was quiet when we got here. Rather than burst in, we looked through these bullet holes. And . . . well . . . we just stayed here."

"That's all right," said Perkins.

"It'll make it easier for me to brief you." He stood for a moment watching his guest drive off in the jeep.

"I still don't see," said Macklin, "how that fellow got in here. I gave strict orders he was to be kept out."

"Well," said Perkins, turning away, "don't worry about it. We have work to do. And he has work to do. Perhaps some day he'll discover how to make his matter transmitter and then possibly everyone will be too busy to make trouble, and we'll be out of a job."

"No need to worry about *that*—" began Macklin, and cut off abruptly.

Perkins spun around, frowning.

In the distance, the jeep was stopped. The hood came down as Perkins watched, and a faint clang reached him. He and Macklin glanced at each other. There was the faint silvery flash of what looked like a brightly polished wire cable tossed into the trailer. The far-off roar of the engine reached them. The jeep started forward.

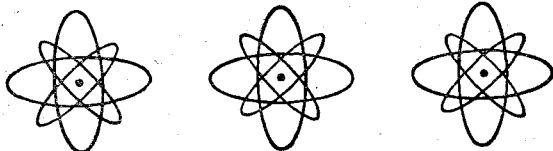
Perkins and Macklin blinked their eyes.

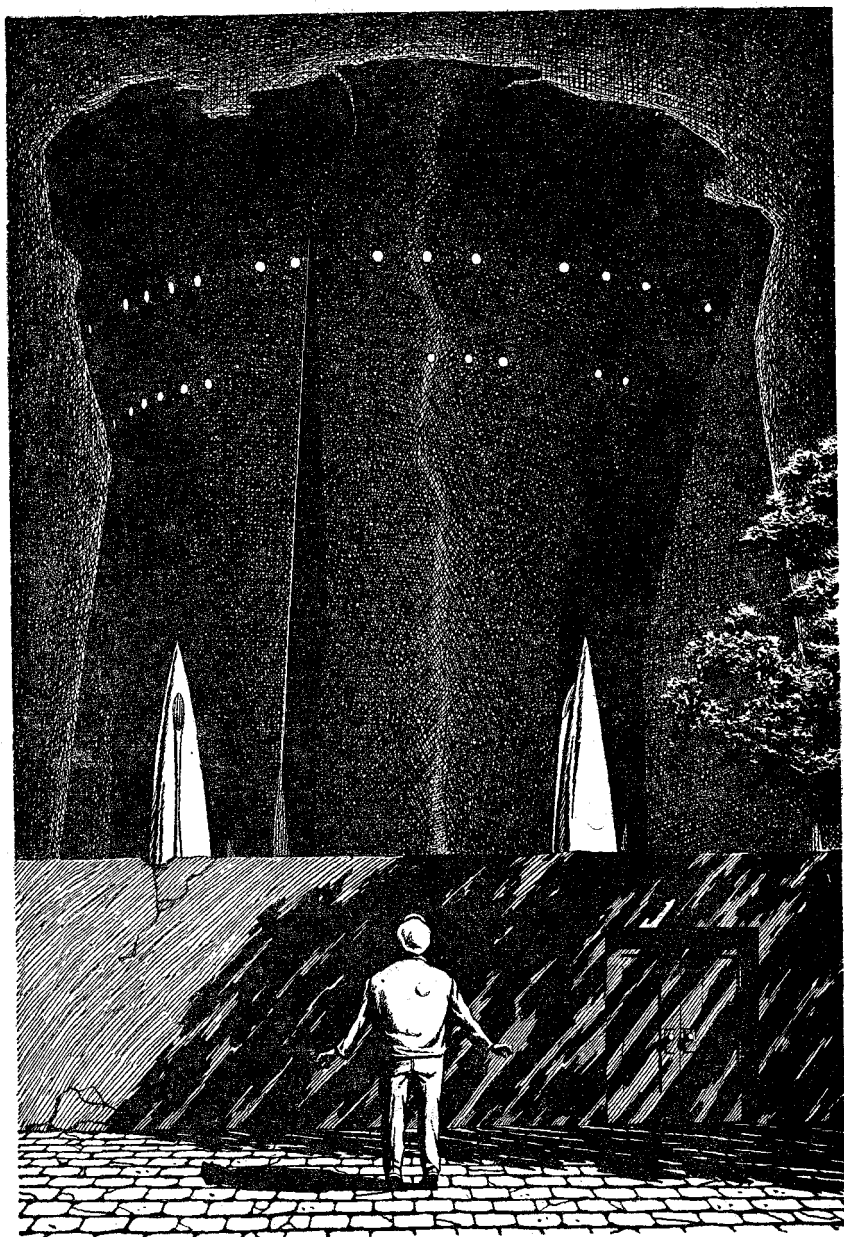
The jeep was gone.

Perkins grabbed Macklin by the arm.

"Let's get to work," he said.

THE END





THE FIRST INCH

BY JON STOPA

Extracting information from the Universe isn't easy—but the Universe doesn't resist. It just doesn't care. But extracting information from a highly willing alien, who'd rather die than yield...that takes finesse. Or a remarkably unkindly sort of imagination....

Illustrated by van Dongen

*So close behind some promontory lie
The huge Leviathans to attend
their prey,
And give no chace, but swallow in
the fry,
Which through their gaping jaws
mistake the way.*

—Dryden's Annus Mirabilis

Sidney Coleman stepped through the mess-hall door and looked upward searching the night sky of Altair-Earth. The air was crisp, not having settled down to Earth norm yet, but the hot coffee filled his body with protective warmth.

He held back in the doorway lighting a fat cigar, then moved

away from the building and headed for the high rise behind the empty city. *Expectations MCXXI* was due tonight, but the slight cigar glow would make no difference. Only bright lights could be spotted from space.

The streets were quiet and deserted, everyone was preparing for the job that would have to be done tomorrow. Coleman stumbled slightly over the imperfectly laid brick walk in the dark moonless street. Thank God, he thought, that he would not have to be there in the morning when the others unseal the starship and explain to the colonists that their efforts had been in vain:

their long years on the sublight ship had been wasted—in the meantime mankind had invented the macrolight drive.

Coleman sighed, crushing the half-smoked cigar under his heel. He was a communications man, and his job was to get in contact with some of the cultures that had shifted during the long journey between the stars. Even when there was no marked change he still was needed, many of the ships launched eight and ten hundred years ago spoke a tongue almost forgotten now. But tomorrow he shouldn't be needed at all, the *Expectations MCXXI* had been one of the last ships to leave Earth before the drive had been discovered. Its culture shouldn't have deviated far enough to need interpretation.

His breath grew heavy as his stooped, bulky form labored up the steep incline. The chance that *Expectations MCXXXI* would land here was extremely slight, but Coleman used any excuse handy to come up here and look at the stars—at one time he hadn't done it alone, but that was another time and another place.

He stood looking silently over the dimly lit town that they had just built—a hell of a consolation prize for someone. The stars were quiet little beacons in the grave black sky. Somewhere out there over a thousand ships were slowly crawling just under the speed of light through the vast distances between the stars. Some would arrive next year, some

in the next century, and nothing could be done about it.

Macrolight space was funny in that respect, there was no one-to-one, point-to-point, correspondence between it and normal space. If a line was drawn from star to star in macrolight space, with units of a mile scaled on it, and then translated into normal space, the distance between each mark would be proportional to the distance away from each star. Near each star they would seem to touch, while halfway in-between them the points would be light-years apart. And ships halfway between the stars in normal space could not be reached because their slight mass did not warp macrolight space enough to pin point them. When a sixteenth of an inch may mean light-years, navigational instruments cannot be devised delicate enough to make the translation.

Absently he started to whistle an ancient bit of music. It had always pained him that the time-viewers could pick up light and not sound. He would have liked to hear more than the present day approximation of the lost music.

Suddenly a light appeared just below Altair-Mars, expanding rapidly and dropping straight down. Coleman felt his heart leap—what were the odds that the ship should pick this spot to land?

The flare of light grew closer, resolving into three pencils of flame. One white, the other two pale blue. He felt shock tingle at the base of his spine.

Something was *very* wrong.

The two blue flares were the jets of the lookout ships, and they *never* revealed themselves unless the incoming starship was in grave trouble. Now the whole party was given away.

Lights flared up around the spaceport, and the wail of the crash mechs carried through the thin night air to the hilltop. Coleman stood for a moment, then started down, wishing that he had brought a torch. He knew he was going to be needed, this was only the second time in fifteen landings that s.o.p. had been broken.

Coleman walked backwards away from the wall, trying to see what was going on. The gates were all locked. Just over the top he could see the slim points of the two lookout ships; but the thing that held his eyes was the starship that hulked between them. The black battered hull curved gently outward until it extended over the other two ships and was roughly three times their height — *then it stopped*. Dead. There was nothing after that.

The entire top three-thirds of the starship was gone.

A thousand different explanations went through his head, but not one of them made any sense. The ship was fully automatic, and could take care of anything from a revolution on shipboard, or a stray planet on its course.

He ran over to the nearest gate and banged on it hoping that some-

one might hear him above the racket. Slowly giving up in disgust he slumped down and sat leaning against the door. The roar of the machines had a numbing effect, and he felt the long needed sleep taking hold.

A click sounded, and the gate opened, sprawling Coleman out on his back. He looked up to see a tall thin man look down in surprise, then reach down and help him up.

"Coleman—where have you been? We've been looking all over for you."

"Les," said Coleman, "I would have been here long ago if you hadn't locked me out."

Les squinted his beady eyes looking hard at Coleman in the glare, then the man shrugged and grabbed his arm, pulling him towards the Administration Building. "Couldn't help that, the port threw it up the minute the crash warnings were sounded."

"What happened?" said Coleman as they hurried across the tarmac towards the heavy walled building. The field was almost empty.

"Nobody knows, Wilcox has a bunch of the colonists up in his office now, but we can't make head nor tail of 'em."

Coleman nodded vigorously as they climbed the steps and went through the thick doors, but didn't try to say anything over the sudden whine of a hoist as it erected itself alongside the starship.

Once inside he said, "Make any progress at all?"

"I don't know. I've been looking for you ever since we got hold of the colonists." Les stopped and knocked quickly at a door.

A heavy voice answered "Yes?"

"Les—I've got Coleman."

There was a scurrying sound and the door opened, revealing the voice's owner. Wilcox was a short thin graying man, and when he spoke his voice seemed to belong to someone else. It was too heavy.

"Come on in. We've been waiting for you." Wilcox gestured over his shoulder "I can't understand more than one word in fifty."

Coleman stepped past Wilcox and looked at the men that Wilcox had pointed to. There were five of them, big hulking hairy looking brutes, all completely naked and caked with grime. Which was not surprising, considering the condition of their ship. They were lucky to have enough of it left to live at all.

The biggest one stood up as he approached, and eyed him in a calculating manner. Coleman stopped about five feet away, uncertain as to what he should do next. He almost choked as he got a good whiff of the colonist.

The bearded man stood facing him for another moment, then without any warning he moved with the speed of a cat striking, and put his arms around Coleman. For a moment Coleman thought he was being attacked, then he realized that the man was not trying to choke him with the beard, but was kissing him.

This close up the unwashed smell was too much, and Coleman had to pull himself out of the man's grasp before he was knocked out.

"*Whew!*" he said as he stood at arm's length, restraining the colonist from coming any closer. "Wilcox, why didn't you warn me?"

The short thin man came to his side and said, "I didn't want to prejudice your reactions."

Coleman glanced at Wilcox's face out of the corner of his eye and caught the smile that threatened to break across his thin lips. "I'll bet you didn't."

"Honestly—" Wilcox broke off as the colonist started to talk.

At first the naked man's words were meaningless to Coleman, then somewhere a responsive cord was struck, and every third word sounded familiar. Suddenly the language was keyed in and everything dropped into place.

"Wilcox, you'd better send up your lookout ships again."

"Why?"

"Because, this fellow's speaking Anglo-Spanish. This ship left Earth about three centuries before the *Expectations MCXXI*."

Wilcox stood looking at Coleman, then turned and went to his desk and gave a few orders. Outside the lights went off, and the crash machinery went silent. Whatever happened, the *Expectations MCXXI* must not be informed of their presence until it could be broken gently to them.

"Now then," said Wilcox, his

heavy voice filling the room, "what happened?"

"What . . . happened . . . to . . . your . . . ship?" said Coleman, dredging his mind for the unfamiliar words.

The colonist burst out with a flow of words that washed over Coleman's head and was gone before he could understand half of them.

Coleman waved his hand. "Slower . . . please."

The man cocked his head to one side, then started over again emphasizing each word. Slowly Coleman understood what happened to the starship.

"Well, what did he say?" asked Wilcox after the colonist had turned away from Coleman and sat down.

Coleman pulled himself out of his habitual slouch, and for a moment he stood a good three inches taller. "They themselves don't quite know what happened. They had been on course to a much farther star system, and everything had been quite normal. Suddenly, without warning, a fleet of small ships appeared and surrounded their ship. For an hour and twelve minutes nothing happened, even though the colonists tried their best to open communications with the strange ships. Then, when they least expected it, the little ships opened fire."

Coleman walked over to the heavy chair near Wilcox's desk and slumped down into it. "The colonists, of course, had exteriorly mounted weap-

ons and fought back. But the attackers were more powerful, and didn't stop until the whole front end had been blown apart." He shrugged, "After that the colonists took what was left of the ship and headed for the system nearest to where they would be at when they could bring it down to planetary speeds. That was about ten years ago."

Les, who had been silent since they had come into the room, said, "How did they find the starship?" It was more of a plea than a question.

"A good question," said Wilcox. "How did they find it? If *we* knew, *we* wouldn't be here."

"That's not the real question," said Coleman, as he ran his hand down the arm of his chair. The thing had been vibrating ever so slightly for the last minute and a half. "The real question is, *who* are the attackers."

"Both of them are important," said Wilcox, "and both have to be answered."

"Well," said Coleman, "part of the answer may be right on that ship. After that attack—" He broke off. The vibration had increased, and now the glass in the window was rattling.

"What's that?" Les asked foolishly. Coleman turned and glared at him. The man was all right as a radio engineer, but at other things he had a tendency to be downright stupid.

Suddenly the room started to sway

back and forth, pitching like a small boat on a choppy lake. Coleman tightly gripped the chair which slid first one way then the other. He had a dim memory of Les shouting something, then tumbling to the floor. Wilcox pitched off his desk where he had been sitting and fell across Coleman's lap, where he held on for dear life.

Through the thick walls they heard the agonized squeak of metal against metal, then in a few seconds, a tremendous crash as the hoist hit the ground. For an instant gravity lessened, and the five colonists, tightly balled together, rolled past. Coleman squeezed his eyes shut and prayed. If one of those ships out there should topple—

Full gravity returned with a thump and the chair, already overloaded, collapsed and sent Coleman sprawling. He tried to get up but Wilcox refused to let go, and so he started to crawl across the room with the man hanging to his legs. Suddenly the floor heaved violently, and Coleman saw the wall rush at his face.

The first thing Coleman heard as he awoke was Wilcox shouting "... I don't care. Get that hoist up. We've got to unload that ship before *Expectations* MCXXI arrives, and get it out of here."

He opened his eyes and winced as he was struck by the bright light. Gently he felt his nose. It felt broken. Coleman experimentally flexed his muscles. Nothing else seemed

any worse than bruised, and he got shakily to his feet.

The office was a shambles, with furniture scattered and broken, and blood smeared on one wall. Les and the colonists were gone.

"Well, you're with us again." Coleman turned around. Wilcox was perched again on his desk, his hand forever resting on the communication box. The big gray ugly desk was bolted to the floor, and it took more than an earthquake to shake it loose.

"I thought," said Colman, automatically fingering his throbbing nose, "that survey said this place was geologically stable."

Wilcox shrugged, bouncing off the desk, "We'll catch up with them later. Right now, I've got a crew out setting up stabilizers."

Coleman frowned, even though it hurt his nose when he did. There was something that he wanted to remember, but the thought was elusive. Instead he said, "Where are our dirty friends?" He gestured over to where the colonists had been.

"Les took them over to first aid. They needed it. Here, have a cigar, you look like you need one." Wilcox reached over and handed one to Coleman. The short man didn't smoke them himself, but everyone else on the welcome team seemed to take on Coleman's habit and was continually loading Wilcox with them.

Coleman bit the end off and lit it. The smoke penetrated up into his nose causing him to sneeze, and

the blood that had clotted while he had been unconscious broke free. He cursed under his breath and balled his handkerchief against the bleeding nostril.

"Now look what you did," he said, crushing the almost unsmoked cigar under his heel.

Wilcox clicked his tongue and said, "Every silver lining has its dark cloud around it."

"Yes, but does mine always have to be you?"

Wilcox clicked his tongue again and said, "You started to say something before the earthquake. What was it?"

Coleman limped, perhaps a bit more pronouncedly than necessary, over to the desk and sat on a corner. Almost everything else in the room had been pretty well battered, and after the last chair had collapsed under him, he didn't want to take any chances.

"Oh, I was just about to tell you that they had captured one of the attackers. Seems that when the other ships disappeared several were left behind, destroyed by the colonists' action. The attackers were aliens, but from his description I don't recognize the type."

Coleman stopped, then continued as casually as he could while holding a bleeding nose with an old handkerchief. "They still have one of them—*alive*."

The hoist climbed slowly into the glare-hidden night sky, its damage, if any, was unapparent. Coleman

turned the handkerchief around and started soaking the clean side. A continuous stream of colonists, dirty, naked, and in some cases bloody, came out of the lower hatch and out into the cold night. A whole squad of the welcome team was waiting for them with blankets and hot soup. Quite a few colonists hesitated at the door, frightened by the cold and the tremendous open space, but the smell of hot soup and the blankets thrown over their shoulders brought them out. If that wasn't enough, the pressure of those in back forced them out.

"What do we need the hoist for?" shouted Les over the machine's whine. Close up it was almost unbearable.

"We—" Wilcox, tried to answer then he gave up. "I'll tell you when it stops."

"What?"

"I said," shouted Wilcox again, "I'll tell you when the hoist stops." He was shouting the last three words in the sudden silence as the hoist reached its full height and turned itself off.

"Oh."

"Never mind," said Coleman through his handkerchief. "We can talk on the way up."

"Let's go," he said in Anglo Spanish to the colonist at his side. Right now they all looked alike, but after they shaved and scrubbed they would take on a little individuality.

The four men stepped onto the small platform and Wilcox pressed



the starting button. Slowly it lifted along the side of the hoist. From this distance Coleman could see the scratched paint and the dented crosspieces where the machine had scraped against the hull of the starship and the battered plates where it had hit the tarmac.

"You didn't answer me yet," said Les.

"Oh. Well, our friend here"—Wilcox gestured at the colonist who was clinging to the railing with a wild look on his face.

"Roget," supplied Coleman, his voice muffled by the handkerchief.

"Our friend Roget says that they have the alien locked up in a compartment up near top."

"Never mind," said Coleman, "here we are." The platform came to a smooth stop, and the hoist slow-

ly swung it over until it came to rest against the hull. Roget walked across the platform, his blanket flapping about him in the stiff cold breeze, and produced a silver block of metal from somewhere on his person. He held it against the black metal wall and waited for perhaps a second. A section of the hull slid back and he joyfully rushed through into the opening.

The other three stepped in after him.

"The air's not bad here," said Wilcox, mildly surprised. "After those lower levels, I was afraid that we might need spacesuits to be able to stand the stink."

Roget motioned Coleman closer and said slowly in Anglo-Spanish, "The creature breathes air—our air that is—but it uses very low pressure,

and it stinks badly. It would be best if we use suits."

Coleman nodded. It was a good thing that the alien breathed the same sort of air as did humans, otherwise they wouldn't have been able to keep it alive. The ship had no facilities for foreign atmospheres.

"Looks like we'll have to wear suits anyway, Wilcox," he said.

"Oh?" said Wilcox, then he followed Coleman's eyes to the inner door of the air lock. "Oh."

The four men hastily slipped into spacesuits taken from a locker inside the lock. Once air-tight Roget put the silver block against the inner door and the outer one slid shut. Their suits ballooned up and the inner door slid open.

Roget stepped through into the corridor and impatiently waved the others on. They followed as he went down several dozen feet and stopped before a door.

"It's in there," he said to Coleman.

Coleman turned to Les and Wilcox and said, "Roget says that it's in there."

The door slid open and they saw the alien for the first time. It lay in the center of the room, a tremendous mass of blue-green flesh that resembled nothing so much as a half melted lump of moldy butter. For a long time both the alien and the humans stood opposite each other motionless. As the newness of the creature disappeared Coleman began to make out details. Near the top the blue-green skin grew more blue and

the texture became furry—no, he changed his mind, whatever it was, it looked more like . . . like grass. Farther down the smooth flesh the grasslike hair sprang up again and grew progressively longer until at the floor it was several feet long.

Suddenly the creature opened a blue eye and looked at them. Coleman quickly corrected himself. It only looked like a blue eye; it was a disk about three inches across, white around the rim, but quickly shading into blue, until it was a deep blue-black in the center.

The alien moved back a little, then without warning it rushed towards them. Startled, Coleman, Les, and Wilcox fell back away from the doorway.

Roget, who had stood his ground, turned and smiled broadly at Coleman, "That's all right, it's just hungry," he said, as the creature tugged at his legs with its whiplike tendrils.

"It's safe," Coleman said over his shoulder as he edged closer. Then in Anglo-Spanish he said, "What do you feed it?"

"Oh, just about anything. It leaves what it doesn't want."

"It must be missing things in that diet."

Roget shrugged his massive shoulders, "It was almost round when we found it. But it's still alive."

Coleman turned to Wilcox, "We'd better take it out of here. How soon can we have a room set up for it?"

Wilcox looked pensive for a moment, then he said, "Providing the air-tight rooms didn't spring a leak

in the quake, about a half an hour."

"Good." Then in Anglo-Spanish, "Let's go."

"O.K.," said Roget who had been trying to follow their conversation. Then the colonist turned and shooed the alien back into the room, "Go on, get back in. No food now. Later."

Coleman raised an eyebrow, "It can understand you?"

Roget nodded, "It can even talk, almost better than you."

Coleman felt a tremendous load lift off his mind. He had had visions of trying laboriously to communicate with the thing by an improvised Morse code, or perhaps some sort of sign language. It would be hard enough to start from scratch like that with a human being, but to do so with an alien creature with perhaps different senses, and no common means of communication would be near impossible.

Coleman looked upward as the hoist lifted the air-tight mobile carrier up to the lock far overhead. The sun was rising in the east, paling the port lights.

He looked down at Wilcox at his side, "Doesn't look like you'll have it out of here for another few hours."

"Yes. And won't you know it, the *Expectations* MCXXI will come in and just *happen* to land here just as we're about to get this thing off the ground."

"Wilcox," said Coleman changing

the subject, "how much trouble did the quake cause in town?"

"Too much," said the short thin man. "I'll know better today when I send out a few inspection crews, but I'm afraid we'll have to send for the construction crew again."

"That'll take time. They probably are halfway to Andromeda by now on the next welcome."

"Until then," continued Wilcox, "we'll let these colonists stay here—*Look out!*" He yanked Coleman out of the way as the hoist lowered the platform down where he had been standing.

Les jumped over the side to the ground and said, "We didn't have much trouble at all. Roget over there"—he pointed to the newly cleaned and clothed, but stubbornly unshaved colonist inside of the railing—"talked it into the wagon just as easy as you please."

Coleman stood back while the other three men took the railing apart. At last they rolled it off the platform and onto the ground.

The hoist moved up and out of the way, and Les started the cart over towards the quarantine building with Roget sitting on the roof.

Coleman watched them disappear across the tarmac, then he turned to Wilcox. "Do you realize what this means?" he said, waving his hands towards where the lookout ships had stood. "Once we find out how those aliens found this ship it'll mean the end of this macabre welcoming committee. The hard part is over."

"Maybe," said Wilcox yawning.

"I don't know about you, but I'm dead." He turned and started towards his quarters. "See you in about a year, I bet I haven't slept in close to two millennia."

Coleman looked after him impassively. Wilcox could afford to sleep, but his work was just beginning. He turned and started in the direction the cart had taken.

Les had already installed the alien in its depressurized quarters and was trying to make it understand him by shouting each word loud and clearly with a notable lack of success when Coleman entered the room. He had reached the point where he merely grasped the microphone in a bloodless hand and bellowed curses at the creature on the other side of the glass, as it looked blandly back at him with its single blue eye.

"Well," Coleman asked mildly, "why don't you put it in writing . . . of course, it probably couldn't understand that, either."

Les stopped in mid word with his mouth wide open. For an awfully long time it looked like it would stay that way, then he snapped it closed with an audible click.

"I'm glad you came," said Roget, who had been in one corner, wincing at each shouted word. "I really wish I could understand what Les was trying to tell it."

Coleman nodded and said, "We'll have to teach you a more modern tongue, but first we have to find out a few things from the alien."

"Les," he said, switching languages for a moment, "get the lab boys in here, I want a complete biopsy on that thing."

"Sure," said Les, abashed at his previous conduct. He turned and left the room.

"Now then," said Coleman, "does it have a name? We can't very well keep calling it 'the alien' all the time."

"We've called it all sorts of things," Roget shook his head sadly, "but most of them aren't fit to print." He looked musingly at the alien. The large blue eye returned his gaze. "It will, however, answer to Fido."

"Fido?"

"Yes. A name commonly given a dog in our day, but if it doesn't know, why should it care?"

Coleman picked up the mike, switching it on, and walked up to the glass wall. "Fido," he said, "I have some questions I want to ask you."

A humming sound came over the speaker that connected the two rooms as the alien activated certain tendrils preparatory to speaking. "Yes?" it buzzed.

An hour later Coleman gave up in disgust as Farnum and his lab men crowded into the interview room with their equipment. "Come on," he waved at Roget who had been sitting quietly and tugging at his beard while the alien had refused to answer Coleman's questions, "let's get out of here."

"I'm sorry," said Roget as they

went through the heavy outer doors and stepped onto the tarmac, "but I could have told you that it would not answer your questions. It was obvious to us that it had a faster-than-light drive—that's why we bothered to keep it alive all this time."

"Ten years?"

Roget nodded.

Coleman felt the heavy hand of defeat rest itself on his shoulder. If in all that time the colonists had been unable to get an answer, what chance had he? In ten years a lot of things can be tried, everything from torture to kindness. His only advantage was that he had a technology that was more competent than theirs. After all, they had not had five hundred years of contact with aliens, nor even the full technology that they would have had if they hadn't lost the front end of their ship.

A blare of loud-speakers warned them back as activity around the base of the half destroyed starship increased. It was almost ready for take-off now and in a few minutes it would be leaving to orbit around Altair-Clarke. The planet was so far out from its primary that the traditional nine names had been finished and the Reimer list was used, of which Clarke was the fifth. It was far enough out so that it would go unexplored, if indeed, noticed at all. The light supplied it by Altair was so weak that only nonoptical instruments could locate it at any distance

greater than a few billion miles.

Wilcox walked around the far side of the unloading crew giving last minute orders.

Coleman hailed him. "Wilcox! I thought you were going to bed."

Wilcox turned around and walked over to where Coleman and Roget were standing. He snorted, "No such luck. It seems that nobody here knows how to handle one of these old ships."

"*Expectations MCXXI* enter the system yet?" asked Coleman.

"No." Wilcox looked back at the final stages of the unloading and said after a pause, "It isn't serious—yet. There are many things that could be wrong, but not *seriously* wrong. The original calculations could be off by just a hair and it would be enough to throw them off days—or even years, for that matter. Or their navigation might be off a billionth of a degree some place, and they might be hell gone for leather in any direction. But all that can be corrected. They've got enough reaction mass to return them to Earth, if necessary."

"I wish things were as simple for me as they are for you," said Coleman. "All you have to do is worry."

"Why?" asked Wilcox turning back. "Having little troubles?"

"Well, if you consider an intractable alien weighing about eight hundred little, yes. How the devil are we going to make a thing like that talk? Jab pins in it?"

"That's, as you said, your worry," Wilcox shrugged. "By the way, I

noticed that your nose stopped bleeding, how does it feel?"

Coleman gingerly felt the large injured appendage. He winced as pain shot through where he touched it. "It hasn't set right. I just noticed in the mirror that it's off a few degrees to the right."

"What?" shouted Wilcox gleefully. "Let me see that." He grabbed Coleman's shoulders and turned him until he was standing squarely in front of him.

For a minute Wilcox carefully examined the damaged proboscis, then he doubled over in heavy booming laughter, "I'll be darn—cock-eyed!"

Coleman stoically withstood the indignity as long as he could, then he calmly picked up the little man and threw him over his shoulder.

"Hey, what are you doing?" asked Wilcox, alarmed.

"I," said Coleman, starting for the nearby river, "am going to see how you like taking a bath."

Coleman waved a stubby finger at the bloated figure of the alien, and said, "O.K., now what do we do?"

Roget tugged gently at his beard and said nothing. In the week that had gone by the tension generated by the nonappearance of the *Expectations MCXXI* had reached everybody, including the colonists. Nobody had been left out, from the crews of the lookout ships to the biolab men working on Fido.

Roget followed Coleman's finger with his gaze and rested his eyes on the alien. It no longer looked a fried egg sunny side up, but had returned to its original shape and looked like a blue-green balloon filled with water. That had been the biggest surprise. The creature had a fantastic metabolism, and much to everyone's surprise it apparently had been getting very little nourishment from the food supplied it by the colonists. All that time it had been living off its body tissue.

In the week past it had turned close to fifty per cent of the food the bio men had fed it back into body tissue. An incredible feat, and one that had the bio lab swearing that it couldn't be real! Twelve hours ago it had stopped talking, and there was no way that they could make it respond.

"I think," Roget said, "I know what happened."

"Well, don't keep it secret from me," Coleman muttered.

"It's simple, really. Fido must have been slowly starving on what we were giving it, and now that you've fed it so well it needn't worry about you starving it into submission. It knows that you want that information badly enough to keep it alive unharmed."

Coleman shook his head glumly, "Don't tell me we'll have to wait another ten years until it's half starved again."

"I suppose so." Roget shook his massive shoulders and yawned loudly. "Maybe you can get some re-

sults with all that technology of yours, but I doubt it."

"If there was only some way I could make it *want* to tell me what—" Coleman broke off as the outer door swung open and Les rushed into the room.

"Survey's arrived, I thought that you might want to know," said Les, his narrow chest heaving as he caught his breath.

"When did they get here?" asked Coleman, ignoring the puzzled expression on Roget's face.

Les wiped the sweat off his pinched features with a grease-covered handkerchief. "Oh, about an hour ago, but they remapped the planet before they landed."

"Where are they now?"

"That's what I came here for. They headed right for Wilcox's office. I thought you'd want to see the sparks fly."

Coleman nodded slowly. Sparks would fly, Wilcox was on edge enough with the missing ship, and he just needed this excuse to go over. "I'll be right with you," he said as Les started moving towards the door. Then slipping into Anglo-Spanish he said, "Roget, you stay here and watch Fido. You might think of a dodge that hasn't been used yet."

Wilcox answered the door. His face was pale, with his eyes protruding slightly and his mouth a mere white slash. He led Coleman and Les over to a large tall figure dressed in black who was standing by the

desk on which was spread a geological map of Altair-Earth.

"Mr. Mawson of survey, Mr. Coleman of communications theory, and Mr. Les, communications."

Hands were clasped briefly and politely, then Coleman said, "Well?"

"The answer is simple," said Wilcox, his voice strangely thin. "The quake had been planet-wide."

Mawson nodded and pointed to the map. "The lines in blue represent the geological structure of Altair-Earth before the quake. Now notice the red lines superimposed on the blue. Those represent the Earth faults after the quake."

Mawson stood aside as Coleman and Les crowded around the map. Finally after a long time Coleman looked up and whistled, "The whole planet looks like it was put in a mixer."

Mawson said, "Yes, but did you notice that the band of greatest damage bisects the planet almost perfectly. It's a little hard to see it on this flat projection, but the planet is roughly cut up into two hemispheres where the damage was much less."

He looked at them, "Fortunately for you, you're near the center of one of them."

Coleman asked, "Have you any idea what caused it?"

Mawson looked at his fingernails, then rubbed them briefly on his lapel. "Ordinarily I'd say an approach by a body of planetary mass, but not this time. The whole thing must have occurred in microseconds. Otherwise the band of intense dam-

age would be bloated in the areas that turned under the intruding body due to the rotation of Altair-Earth during the time of interaction."

Les broke the long silence that followed Mawson's remarks by saying, "Well, what *did* cause it?"

"I'll be darned if I know," said Mawson. "About the only thing to do is go back and look."

Coleman said, "Do you think we can carry out the calculations here? There are a lot of unknowns in this solar system, and besides, I don't know if we have enough high-powered math boys to swing it."

The man in black shrugged, "What else are we going to do . . .

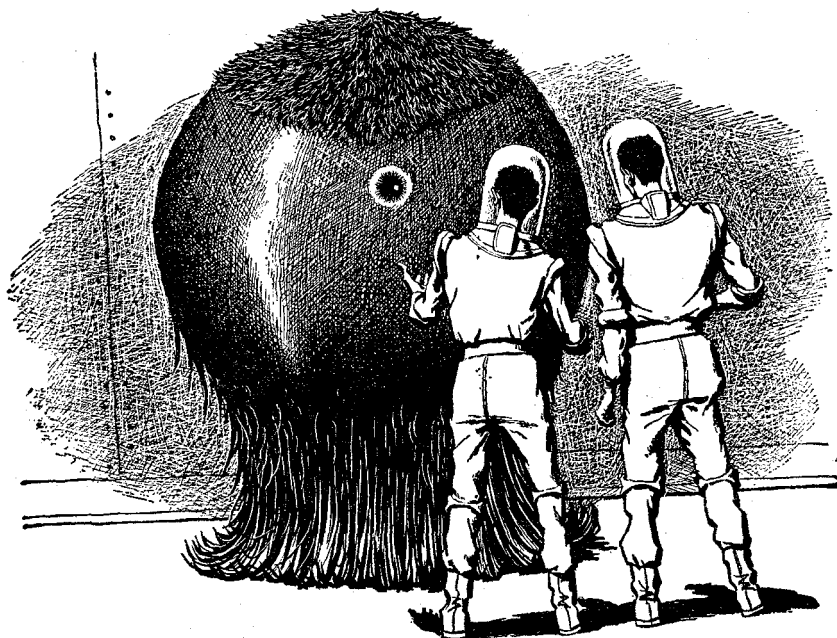
what else can we do but try?"

Coleman hesitated for a while, then said, "Mind if I go along? I've never been on one of these time trips."

Wilcox unfroze and nodded before Mawson could say no. "I think you should—give you a chance to take a break and come back to a fresh start."

Mawson assented reluctantly after Wilcox described the situation.

Coleman and Wilcox entered the survey ship shortly after dawn two days later. They met briefly at the bottom of the ramp and looked back at the hazy disk of the rising sun,



"Any news from the lookout ships yet?" said Coleman as he chewed on an unlit cigar.

"Nothing. There hasn't been anything larger than a few minor comets entering the system in the last twenty-four hours."

"I haven't had any luck with Fido either. The thing just lays there, looking at me with that blue eye and doesn't move unless we feed it. Even then it doesn't do anything but move to the feeder and back again. I'm stumped."

No more words were exchanged as they climbed the ramp and entered the ship. Mawson met them at the hatch, and welcomed them aboard quietly.

"We leave in about fifteen minutes," he said.

"Good. Have a cigar?" Wilcox offered hopefully.

"Sure," said Coleman.

Wilcox frowned and surrendered the cigar ungraciously as Mawson politely refused. He knew he was Coleman's chief source of supply and he resented the presumption.

"Any special preparation necessary?" asked Coleman as they entered the control room.

"Nothing but the usual. We'll enter macrolight space as soon as we leave atmosphere."

Coleman sat down on the edge of the acceleration couch feeling just a little queasy. "Are there any unusual effects?"

Mawson directed Wilcox to another acceleration couch and then sat on one himself. Several techni-

cians finished last-minute adjustments and soon followed suit. There was nothing to do but wait.

"Have you ever been in macrolight space when your ship was given no destination?"

Coleman shook his head.

Mawson sighed. "That would have made things easier—but here goes anyway. When a ship is given destination it pops in and out of macrolight space so fast that the effect is seemingly instantaneous translation. However when you do not give a destination the ship just hangs in macrolight space."

Mawson leaned back in the couch. "Macrolight space has several interesting properties, among them being that the mind has complete control of matter. For instance, you can step through a wall, or walk on the ceiling for that matter. But the one that we're most interested in at the moment is that 't' or time is not a constant—we can travel back in time as far as we want, but not forward past the farthest point in the future that we really existed in time.

"While in the past we can drop out of macrolight space into the normal universe, but only as observers—the past is immutable. Through some method of which we know little about, we can see what is happening, though we can neither hear nor feel anything that we did not bring along—in fact, since the same physical laws that hold in macrolight space hold while we're in the past, we're rather sure that the 'sight' is mentally induced. It

can't be proved, though, because our instruments work as well there as in normal time."

Coleman sat back, partially satisfied. The explanation was no doubt superficial, but it at least gave him an inkling of what to expect. Reaching over, he clipped his cigar to the ashtray.

Mawson reached over the control board, keeping his hand in the air. "Time?" he asked one of the technicians.

The other man nodded, and Mawson reached down and flicked a switch. For a minute or two nothing happened, then deep within the ship the thrumming sound of jets warming up was conducted through the steel frame and set loose in the small cabin. Coleman felt the skin draw tight on his face as the flesh underneath tensed, waiting for the moment when the ship would come fully to life.

The sound increased, filling the whole room with its power, and slowly a heavy hand applied pressure on his chest, belly, arms, legs and face. Then suddenly it was over and the silence that followed was almost a tangible force.

Mawson stood up and walked to a port. "Well, this is macrolight space. Doesn't feel much different, does it? Come here, look out the port."

Coleman got to his feet, carefully making sure that he kept thinking of the floor as being solid. The technicians were already up and preparing the ship for the jump into

the past. Their job was simple for the moment, the calculations had been made beforehand, and all they had to do was set the controls in the proper order. It would be more difficult coming back when the calculations had to be done over again. The calculations had to be done by humans, because the mathematical transformations were beyond the range of the mechanical computers.

He stepped next to Mawson, and he felt, rather than saw Wilcox step beside him. Through the port he could see nothing. Absolutely nothing. It was as black as pitch. However, as he watched, to one side a blurred patch of light appeared, much like a defused drop of white ink on a black blotting paper. "What is that?" he heard Wilcox say.

"That's the macrolight space projection of Altair. We'll be dropping into the past in a few minutes," Mawson answered distantly.

Coleman stumbled back to his acceleration couch and retrieved his cigar from the ashtray. It was still lit, and he struck it into his mouth, puffing it vaguely. Everything was so unreal. He remembered what Mawson had said: "*The mind has complete control of matter—*"

The room started to shimmer and grow dark, slipping farther and farther away. Someone was shouting distantly.

He awoke with a jar, and instantly everything was bright, hard, real and immediate. Wilcox was standing in

front of the couch holding tightly to his shoulders with a horrified expression staining his face. Mawson was frantically working over the control board with the technicians standing helplessly off to one side. Through the port he could see the familiar stars, hard gleaming points of light that he had seen every night over Altair-Earth.

"What happened?" he gasped.

Mawson looked up from the board with relief. "You'll have to be more careful," he said. "You almost *thought* yourself out of existence. I just managed to drop into normal space in time."

Wilcox finally was able to free his tongue and say, "You just started to fade—"

Coleman managed to pull himself together. "This won't upset the trip to the past, will it?"

"Not in any important way," said Mawson. "We'll just get there a few minutes later than we intended, but that won't matter because I've given us enough leeway. Watch yourself this time, here we go."

Suddenly the stars disappeared and blackness filled the port again. Another pause, and the stars reappeared again. Down below lay the tremendous dark sphere of Altair-Earth at night.

"Cameras set?" said Mawson.

"Check," said one of the techs.

"How soon?" said Wilcox.

"Any minute now," answered Mawson.

A click followed by a high whine sounded, then everything was still

again. The high-speed cameras had done their work.

"That's it," said Mawson pushing his chair back. "The pictures will be ready in a few minutes, and we'll have our answer." He pressed a button on the board and said, "Paul, send up the math boys."

A click sounded, and a roll of tape was ejected from the bank of cameras. Mawson lifted it out of the bin and slapped it into the viewer.

For a minute the picture didn't change. Altair-Earth hung below, a massive black sphere crowned to the east with the brilliant red rim of dawn. High, and to the right, the white point of light that was Altair-Mars hung majestically in the vastness. Beyond, the polychromatic torrent of diamond-sharp stars blazed as it swirled across the screen.

A fleck of blue light identified itself in the center of the screen and grew larger, pulling away from the star field. It expanded rapidly, coming almost directly at them.

Suddenly it exploded through the spectrum as it passed them, and the picture turned to follow it as it disappeared, a pale red light.

"A composite print," Mawson explained. "No camera could turn that fast."

"What was it?" asked Wilcox in a withdrawn tone of voice.

"Just a second, I'll try to freeze the picture," said Mawson as he fiddled with the controls.

Coleman bit his lip as the blue light appeared on the screen, then the red. Something in his bones told

him that he knew what it was already.

The object finally appeared on the screen in it's yellow phase, and Mawson drew it into focus. They looked at it unmoving for a timeless second, then Coleman shuddered and turned away, covering his eyes. He had been right. He heard Wilcox gasp, and then the click as Mawson turned off the viewer.

After a long while Mawson sighed and said, "It looks as though you can quit waiting for the *Expectations MCXXI*. It's come and gone."

Coleman nodded and opened his eyes. An object moving at near light speed in the normal universe increases in mass. The *Expectations MCXXI* had never decelerated to enter the Altair system. It was a gutted hulk.

The silence that followed Mawson's remarks was broken by the math men as they came into the control room to start the calculations necessary for returning to the *real* present.

Coleman raised the intensity of the ultrasonic projector and turned back to the alien on the other side of the glass. It was quivering like a bowl of jello caught in a reducing machine. It couldn't take much more of this.

He reached for the intensity control to raise it another notch, but stopped when Farnum, head of the biology lab, stepped away from a bank of instruments and said,

"Better not. A little bit more and Fido goes boom."

The blond man wiped the sweat off the palms of his hands on his lab coat and said, "I guess we might as well get some sleep. It'll take at least twelve hours before Fido will be in condition again."

Coleman nodded. He felt like he needed at least twelve hours sleep before he could work on Fido. He stretched and yawned loudly, turning off the equipment.

Farnum shook off the white lab coat at the door and hung it up in the small locker just outside. "Good night," he said. "Or should I say good morning," and disappeared down the corridor.

Coleman followed Farnum out of the building but parted from his path at the door and went to the hill back of the town instead of his quarters. Slowly he climbed the slope and looked at the soft stars that arched overhead. Out there were a thousand ships, spread between the stars, slowly creeping outward just under the speed of light. Helpless prey for the aliens that could drop out of nowhere, blast, and return to nowhere.

Tears of frustration filled his eyes. He *had* the answer, right in the palm of his hands, if only he could solve it. His problem stated quite simply was how to make the alien *want* to talk.

Communication is a two-way proposition. The very first thing necessary for it to take place is a medium of information transfer. He had

that. The next thing is the ability to transmit and receive that information at both ends. There was the rub; though both he and Fido had those abilities, Fido chose not to use one of them. It refused to send information.

Coleman lit a cigar and began pacing. How could he make it send information? It had stopped doing so almost completely. A slight wave of excitement washed over him and he took the cigar out of his mouth. He had the glimmerings of an idea.

Coleman burst into Wilcox's office ten hours later and threw a sheaf of papers on the newly repainted desk. He looked around at the faces of Wilcox, Mawson and Les and said with drama that he allowed himself to use only because he was so dead tired: "Gentlemen, here is the answer to our problems."

Then, as his common sense caught up with him, "Or at least the start of the answer."

Wilcox made no effort to pick up the paper; instead he stared blankly at Coleman and repeated, "Answer?"

"Yes," said Coleman, the temptation to dramatize still not completely squashed. "We really had it all along but didn't see it."

"And it's so simple it makes me sick almost. All we have to do is build a unit into the drive that will jump back into the past, and while in normal space zero in on whatever is the target. When 'in' time it can

take as long as it wants to find it. In the case of our sublight ships it can go back to the moment each ship was launched and follow it until it is within microseconds of the 'present' where it slips back into macrolight space and meets the rescue ship. Subjectively, for the unit that slips back into the past, the whole thing might take centuries, but for those on the ship the operation is almost instantaneous."

Misinterpreting the blank looks on their faces, he sought for an analogy. "It's like a radar wave that bounces off a distant object and returns, only instead this 'wave' is sent into the distant past and 'bounces' back to the present."

Coleman looked uncomfortably at the silent faces. Were they getting it, or weren't they?

Finally Mawson broke the silence. "That's a very nice theory, but do you realize the computation necessary for every second in the past? Why it took the entire math department three days to figure out the calculations for our three hours."

"We'll just have to build computers to handle the math, that's all," said Coleman.

"Computers can't handle that level of math . . . can they?" Les looked questioningly at Mawson.

"Of course not," said Mawson. "Computers can do simple math only, and they can do it fast. But when it comes to macrolight time translations, they're lost."

"Well," said Coleman unperturb-

ed, "we'll just have to build one, that's all. After all, if the aliens can, so can we."

Wilcox found himself repeating foolishly again, "Alien?"

Mawson stood up and said, "Alien? You mean you managed to make Fido talk?"

"Yes," said Coleman, his sense of the dramatic running away with him again. He took out a cigar and lit it with a slow overly casual sweep of his arm. Then he folded his pudgy arms and sat on the corner of the desk, the picture of innocence.

"For crying out loud," said Wilcox, "stop acting so cute."

"It was simple, really," said Coleman, unwinding his arms. "For a long time I had been suffering under the misapprehension that Fido was not sending, just receiving. Then it occurred to me that his brain was constantly sending and receiving messages of sense data and so on from the rest of his body."

"Now if there is anything more important than everything else to an intelligent being, it is communication. Every day of our lives we seek to communicate with each other just a little bit better. It's the basis of the age-old dream of telepathy, and the reason why mankind has never stopped dreaming of that power. Even Fido had these instincts to the extent that he learned to speak—which was quite a trick, by the way, since his species does not use an audible form of communication.

Some sort of sign language, Farnum tells me.

"What I did was break all communication between Fido's brain and its body and the outside world, by having Farnum block all nerve paths at the brain. However, I did leave the audio-control nerves open. It was all output with very little feedback. Practically speaking, Fido was completely isolated—perhaps more so than any living creature has ever been."

Coleman stood up slowly and shrugged. "Do you have any idea what it is like to be fully conscious and unable to feel, hear, see, or say anything? Without outside information it is impossible to tell how much time has passed—it might be an hour, a century, or just a few seconds. Fido knew what I wanted. It took an hour and nine minutes before he gave in. Fido had to talk or go mad, so it talked."

The others looked back at him with expressions that he couldn't quite read. "I can't say that I particularly feel very proud of myself." He threw the lit cigar across the room and walked slowly to the door.

Outside the thick walls the sun was shining, and the man-induced first spring of Altair-Earth was taking hold of the land. Coleman walked across the sunlit tarmac with his head hanging from more than just lack of sleep. He had just invented the ultimate in information-extraction—the limiting goal of millennia of tortures.

THE END

THE FIRST INCH

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DANGER — HUMAN!

BY GORDON R. DICKSON



*Perhaps the major danger was simply the
congenital stupidity of the human race.
Too stupid to know when it was licked....*

Illustrated by Freas

The spaceboat came down in the silence of perfect working order—down through the cool, dark night of a New Hampshire late spring. There was hardly any moon and the path emerging from the clump of conifers and snaking its way across the dim pasture looked like a long strip of pale cloth, carelessly dropped and forgotten there.

The two aliens checked the boat and stopped it, hovering, some fifty feet above the pasture, and all but invisible against the low-lying clouds. Then they set themselves to wait, their woolly, bearlike forms settled on haunches, their uniform belts glinting a little in the shielded light from the instrument panel, talking now and then in desultory murmurs.

"It's not a bad place," said the one of junior rank, looking down at the earth below.

"Why should it be?" answered the senior.

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The junior did not answer. He shifted on his haunches.

"The babies are due soon," he said. "I just got a message."

"How many?" asked the senior.

"Three—the doctor thinks. That's not bad for a first birthing."

"My wife only had two."

"I know. You told me."

They fell silent for a few seconds. The spaceboat rocked almost imperceptibly in the waters of night.

"Look—" said the junior, suddenly. "Here it comes, right on schedule."

The senior glanced overside. Down below, a tall, dark form had emerged from the trees and was coming out along the path. A little beam of light shone before him, terminating in a blob of illumination that danced along the path ahead, lighting his way. The senior stiffened.

"Take controls," he said. The

casualness had gone out of his voice. It had become crisp, impersonal.

"Controls," answered the other, in the same emotionless voice.

"Take her down."

"Down it is."

The spaceboat dropped groundward. There was an odd sort of soundless, lightless explosion—it was as if concussive wave had passed, robbed of all effects but one. The figure dropped, the light rolling from its grasp and losing its glow in a tangle of short grass. The spaceboat landed and the two aliens got out.

In the dark night they loomed furrily above the still figure. It was that of a lean, dark man in his early thirties, dressed in clean, much-washed corduroy pants and checkered wool lumberjack shirt. He was unconscious, but breathing slowly, deeply and easily.

"I'll take it up by the head, here," said the senior. "You take the other end. Got it? Lift! Now, carry it into the boat."

The junior backed away, up through the spaceboat's open lock, grunting a little with the awkwardness of his burden.

"It feels slimy," he said.

"Nonsense!" said the senior. "That's your imagination."

Eldridge Timothy Parker drifted in that dreamy limbo between awakeness and full sleep. He found himself contemplating his own name.

Eldridge Timothy Parker. Eldridgetimothyparker. EldridgeTIMO-

THYparker. ELdriDGEtiMOthy-PARKER. . . .

There was a hardness under his back, the back on which he was lying—and a coolness. His flaccid right hand turned flat, feeling. It felt like steel beneath him. Metal? He tried to sit up and bumped his forehead against a ceiling a few inches overhead. He blinked his eyes in the darkness—

Darkness?

He flung out his hands, searching, feeling terror leap up inside him. His knuckles bruised against walls to right and left. Frantic, his groping fingers felt out, around and about him. He was walled in, he was surrounded, he was enclosed.

Completely.

Like in a coffin.

Buried—

He began to scream. . . .

Much later, when he awoke again, he was in a strange place that seemed to have no walls, but many instruments. He floated in the center of mechanisms that passed and repassed about him, touching, probing, turning. He felt touches of heat and cold. Strange hums and notes of various pitches came and went. He felt voices questioning him.

Who are you?

"Eldridge Parker—Eldridge Timothy Parker—"

What are you?

"I'm Eldridge Parker—"

Tell about yourself.

"Tell what? What?"

Tell about yourself.

"What? What do you want to know? What—"

Tell about. . . .

"But I—"

Tell. . . .

. . . well, i suppose i was pretty much like any of the kids around our town . . . i was a pretty good shot and i won the fifth grade seventy-five yard dash . . . i played hockey, too . . . pretty cold weather up around our parts, you know, the air used to smell strange it was so cold winter mornings in january when you first stepped out of doors . . . it is good, open country, new england, and there were lots of smells . . . there were pine smells and grass smells and i remember especially the kitchen smells . . . and then, too, there was the way the oak benches in church used to smell on sunday when you knelt with your nose right next to the back of the pew ahead. . . .

. . . the fishing up our parts is good too . . . i liked to fish but i never wasted time on weekdays . . . we were presbyterians, you know, and my father had the farm, but he also had money invested in land around the country . . . we have never been badly off but i would have liked a motor-scooter. . . .

. . . no i did not never hate the germans, at least i did not think i ever did, of course though i was over in europe i never really had it bad, combat, i mean . . . i was in a motor pool with the raw smell of gasoline, i like to work with my hands, and

it was not like being in the infantry. . . .

. . . i have as good right to speak up to the town council as any man . . . i do not believe in pushing but if they push me i am going to push right back . . . nor it isn't any man's business what i voted last election no more than my bank balance . . . but i have got as good as right to a say in town doings as if i was the biggest landholder among them. . . .

. . . i did not go to college because it was not necessary . . . too much education can make a fool of any man, i told my father, and i know when i have had enough . . . i am a farmer and will always be a farmer and i will do my own studying as things come up without taking out a pure waste of four years to hang a piece of paper on the wall. . . .

. . . of course i know about the atom bomb, but i am no scientist and no need to be one, no more than i need to be a vetrinarian . . . i elect the men that hire the men that need to know those things and the men that i elect will hear from me johnny-quick if things do not go to my liking. . . .

. . . as to why i never married, that is none of your business . . . as it happens, i was never at ease with women much, though there were a couple of times, and i still may if jeanie lind. . . .

. . . i believe in god and the united states of america. . . .

He woke up gradually. He was in a room that might have been any

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office, except the furniture was different. That is, there was a box with doors on it that might have been a filing cabinet and a table that looked like a desk in spite of the single thin rod underneath the center that supported it. However, there were no chairs—only small, flat cushions, on which three large, woolly, bearlike creatures were sitting and watching him in silence.

He himself, he found, was in a chair, though.

As soon as they saw his eyes were open, they turned away from him and began to talk among themselves. Eldridge Parker shook his head and blinked his eyes, and would have blinked his ears if that had been possible. For the sounds the creatures were making were like nothing he had ever heard before; and yet he understood everything they were saying. It was an odd sensation, like a double-image earwise, for he heard the strange mouth-noises just as they came out and then something in his head twisted them around and made them into perfectly understandable English.

Nor was that all. For, as he sat listening to the creatures talk, he began to get the same double image in another way. That is, he still saw the bearlike creature behind the desk as the weird sort of animal he was, out of the sound of his voice, or from something else, there gradually built up in Eldridge's mind a picture of a thin, rather harassed-looking gray-haired man in something resembling a uniform, but at the same time not

quite a uniform. It was the sort of effect an army general might get if he wore his stars and a Sam Browne belt over a civilian double-breasted suit. Similarly, the other creature sitting facing the one behind the desk, at the desk's side, was a young and black-haired man with something of the laboratory about him, and the creature further back, seated almost against the wall, was neither soldier nor scientist, but a heavy older man with a sort of book-won wisdom in him.

"You see, commander," the young one with the black-haired image was saying, "perfectly restored. At least on the physical and mental levels."

"Good, doctor, good," the outlandish syllables from the one behind the desk translated themselves in Eldridge's head. "And you say it . . . he, I should say . . . will be able to understand?"

"Certainly, sir," said the doctor-psychologist — whatever - he - was. "Identification is absolute—"

"But I mean comprehend—encompass—" The creature behind the desk moved one paw slightly. "Follow what we tell him—"

The doctor turned his ursinoid head toward the third member of the group. This one spoke slowly, in a deeper voice.

"The culture allows. Certainly."

The one behind the desk bowed slightly to the oldest one.

"Certainly, Academician, certainly."

They then fell silent, all looking

ASTOUNDING SCIENCE FICTION

back at Eldridge, who returned their gaze with equivalent interest. There was something unnatural about the whole proceeding. Both sides were regarding the other with the completely blunt and unshielded curiosity given to freaks.

The silence stretched out. It became tinged with a certain embarrassment. Gradually a mutual recognition arose that no one really wanted to be the first to address an alien being directly.

"It . . . he is comfortable?" asked the commander, turning once more to the doctor.

"I should say so," replied the doctor, slowly. "As far as we know. . . ."

Turning back to Eldridge, the commander said, "Eldridgetimothyparker, I suppose you wonder where you are?"

Caution and habit put a clamp on Eldridge's tongue. He hesitated about answering so long that the commander turned in distress to the doctor, who reassured him with a slight movement of the head.

"Well, speak up," said the commander, "we'll be able to understand you, just as you're able to understand us. Nothing's going to hurt you; and anything you say won't have the slightest effect on your . . . er . . . situation."

He paused again, looking at Eldridge for a comment. Eldridge still held his silence, but one of his hands unconsciously made a short, fumbling motion at his breast pocket.

"My pipe—" said Eldridge.

The three looked at each other. They looked back at Eldridge.

"We have it," said the doctor. "After a while we may give it back to you. For now . . . we cannot allow . . . it would not suit us."

"Smoke bother you?" said Eldridge, with a touch of his native canniness.

"It does not bother us. It is . . . merely . . . distasteful," said the commander. "Let's get on. I'm going to tell you where you are, first. You're on a world roughly similar to your own, but many . . ." he hesitated, looking at the academician.

"Light-years," supplemented the deep voice.

". . . Light-years in terms of what a year means to you," went on the commander, with growing briskness. "Many light-years distant from your home. We didn't bring you here because of any personal . . . dislike . . . or enmity for you; but for. . . ."

"Observation," supplied the doctor. The commander turned and bowed slightly to him, and was bowed back at in return.

". . . Observation," went on the commander. "Now, do you understand what I've told you so far?"

"I'm listening," said Eldridge.

"Very well," said the commander. "I will go on. There is something about your people that we are very anxious to discover. We have been, and intend to continue, studying you to find it out. So far—I will admit quite frankly and freely—we have not found it; and the consensus among our best minds is that you,

yourself, do not know what it is. Accordingly, we have hopes of . . . causing . . . you to discover it for yourself. And for us."

"Hey. . . ." breathed Eldridge.

"Oh, you will be well treated. I assure you," said the commander, hurriedly. "You have been well treated. You have been . . . but you did not know . . . I mean you did not feel—"

"Can you remember any discomfort since we picked you up?" asked the doctor, leaning forward.

"Depends what you mean—"

"And you will feel none." The doctor turned to the commander. "Perhaps I'm getting ahead of myself?"

"Perhaps," said the commander. He bowed and turned back to Eldridge. "To explain—we hope you will discover our answer for it. We're only going to put you in a position to work on it. Therefore, we've decided to tell you everything. First—the problem. Academician?"

The oldest one bowed. His deep voice made the room ring oddly.

"If you will look this way," he said. Eldridge turned his head. The other raised one paw and the wall beside him dissolved into a maze of lines and points. "Do you know what this is?"

"No," said Eldridge.

"It is," rumbled the one called the academician, "a map of the known universe. You lack the training to read it in four dimensions, as it should be read. No matter. You will take my word for it . . . it is a map.

A map covering hundreds of thousands of your light-years and millions of your years."

He looked at Eldridge, who said nothing.

"To go on, then. What we know of your race is based upon two sources of information. History. And Legend. The history is sketchy. It rests on archaeological discoveries for the most part. The legend is even sketchier and—fantastic."

He paused again. Still Eldridge guarded his tongue.

"Briefly, there is a race that has three times broken out to overrun this mapped area of our galaxy and dominate other civilized cultures—until some inherent lack or weakness in the individual caused the component parts of this advance to die out. The periods of these outbreaks has always been disastrous for the dominated cultures and uniformly without benefit to the race I am talking about. In the case of each outbreak, though the home planet was destroyed and all known remnants of the advancing race hunted out, unknown seed communities remained to furnish the material for a new advance some thousands of years later. That race," said the academician, and coughed—or at least made some kind of noise in his throat, "is your own."

Eldridge watched the other carefully and without moving.

"We see your race, therefore," went on the academician, and Eldridge received the mental impres-

sion of an elderly man putting the tips of his fingers together judiciously, "as one with great or overwhelming natural talents, but unfortunately also with one great natural flaw. This flaw seems to be a desire—almost a need—to acquire and possess things. To reach out, encompass, and absorb. It is not," shrugged the academician, "a unique trait. Other races have it—but not to such an extent that it makes them a threat to their co-existing cultures. Yet, this in itself is not the real problem. If it was a simple matter of rapacity, a combination of other races should be able to contain your people. There is a natural inevitable balance of that sort continually at work in the galaxy. No," said the academician, and paused, looking at the commander.

"Go on. Go on," said the commander. The academician bowed.

"No, it is not that simple. As a guide to what remains, we have only the legend, made anew and reinforced after each outward sweep of you people. We know that there must be something more than we have found—and we have studied you carefully, both your home world and now you, personally. There *must* be something more in you, some genius, some capability above the normal, to account for the fantastic nature of your race's previous successes. But the legend says only—*Danger, Human! High Explosive. Do not touch*—and we find nothing in you to justify the warning."

He sighed. Or at least Eldridge

received a sudden, unexpected intimation of deep weariness.

"Because of a number of factors—too numerous to go into and most of them not understandable to you—it is our race which must deal with this problem for the rest of the galaxy. What can we do? We dare not leave you be until you grow strong and come out once more. And the legend expressly warns us against touching you in any way. So we have chosen to pick one—but I intrude upon your field, doctor."

The two of them exchanged bows. The doctor took up the talk speaking briskly and entirely to Eldridge.

"A joint meeting of those of us best suited to consider the situation recommended that we pick up one specimen for intensive observation. For reasons of availability, you were the one chosen. Following your return under drugs to this planet, you were thoroughly examined, by the best of medical techniques, both mentally and physically. I will not go into detail, since we have no wish to depress you unduly. I merely want to impress on you the fact that we found nothing. Nothing. No unusual power or ability of any sort, such as history shows you to have had and legend hints at. I mention this because of the further course of action we have decided to take. Commander?"

The being behind the desk got to his hind feet. The other two rose.

"You will come with us," said the commander.

Herded by them, Eldridge went out through the room's door into brilliant sunlight and across a small stretch of something like concrete to a stubby egg-shaped craft with ridiculous little wings.

"Inside," said the commander. They got in. The commander squatted before a bank of instruments, manipulated a simple sticklike control, and after a moment the ship took to the air. They flew for perhaps half an hour, with Eldridge wishing he was in a position to see out one of the high windows, then landed at a field apparently literally hacked out of a small forest of mountains.

Crossing this field on foot, Eldridge got a glimpse of some truly huge ships, as well as a number of smaller ones such as the one in which he had arrived. Numbers of the furry aliens moved about, none with any great air of hurry, but all with purposefulness. There was a sudden, single, thunderous sound that was gone almost before the ear could register it; and Eldridge, who had ducked instinctively, looked up again to see one of the huge ships falling—there is no other word for it—skyward with such unbelievable rapidity it was out of sight in seconds.

The four of them came at last to a shallow, open trench in the stuff which made the field surface. It was less than a foot wide and they stepped across it with ease. But once they had crossed it, Eldridge noticed a difference. In the five hundred yard

square enclosed by the trench—for it turned at right angles off to his right and to his left—there was an air of tightly-established desertedness, as of some highly restricted area, and the rectangular concrete-looking building that occupied the square's very center glittered unoccupied in the clear light.

They marched to the door of this building and it opened without any of them touching it. Inside was perhaps twenty feet of floor, stretching inward as a rim inside the walls. Then a sort of moat—Eldridge could not see its depth—filled with a dark fluid with a faint, sharp odor. This was perhaps another twenty feet wide an enclosed a small, flat island perhaps fifteen feet by fifteen feet, almost wholly taken up by a cage whose walls and ceiling appeared to be made of metal bars as thick as a man's thumb and spaced about six inches apart. Two more of the aliens, wearing a sort of harness and holding a short, black tube apiece, stood on the ledge of the outer rim. A temporary bridge had been laid across the moat, protruding through the open door of the cage.

They all went across the bridge and into the cage. There, standing around rather like a board of directors viewing an addition to the company plant, they faced Eldridge; and the commander spoke.

"This will be your home from now on," he said. He indicated the cot, the human-type chair and the other items furnishing the cage. "It's

as comfortable as we can make it."

"Why?" burst out Eldridge, suddenly. "Why're you locking me up here? Why—"

"In our attempt to solve the problem that still exists," interrupted the doctor, smoothly, "we can do nothing more than keep you under observation and hope that time will work with us. Also, we hope to influence you to search for the solution, yourself."

"And if I find it—what?" cried Eldridge.

"Then," said the commander, "we will deal with you in the kindest manner that the solution permits. It may be even possible to return you to your own world. At the very least, once you are no longer needed, we can see to it that you are quickly and painlessly destroyed."

Eldridge felt his insides twist within him.

"Kill me?" he choked. "You think that's going to make me help you? The hope of getting killed?"

They looked at him almost compassionately.

"You may find," said the doctor, "that death may be something you will want very much, only for the purpose of putting a close to a life you've become weary of. Look,"—he gestured around him—"you are locked up beyond any chance of ever escaping. This cage will be illuminated night and day; and you will be locked in it. When we leave, the bridge will be withdrawn, and the only thing crossing that moat—which is filled with acid—will be a mechan-

DANGER—HUMAN!



ical arm which will extend across and through a small opening to bring you food twice a day. Beyond the moat, there will be two armed guards on duty at all time, but even they cannot open the door to this building. That is opened by remote control from outside, only after the operator has checked on his vision screen to make sure all is as it should be inside here."

He gestured through the bars, across the moat and through a window in the outer wall.

"Look out there," he said.

Eldridge looked. Out beyond, and surrounding the building, the shallow trench no longer lay still and empty under the sun. It now spouted a vertical wall of flickering, weaving distortion, like a barrier of heat waves.

"That is our final defense, the ultimate in destructiveness that our science provides us—it would literally burn you to nothingness, if you touched it. It will be turned off only for seconds, and with elaborate precautions, to let guards in, or out."

Eldridge looked back in, to see them all watching him.

"We do this," said the doctor, "not only because we may discover you to be more dangerous than you seem, but to impress you with your helplessness so that you may be more ready to help us. Here you are, and here you will stay."

"And you think," demanded Eldridge hoarsely, "that this's all going to make me want to help you?"

"Yes," said the doctor, "because there's one thing more that enters

into the situation. You were literally taken apart physically, after your capture; and as literally put back together again. We are advanced in the organic field, and certain things are true of all life forms. I supervised the work on you, myself. You will find that you are, for all practical purposes immortal and irretrievably sane. This will be your home forever, and you will find that neither death nor insanity will provide you a way of escape."

They turned and filed out. From some remote control, the cage door was swung shut. He heard it click and lock. The bridge was withdrawn from the moat. A screen lit up and a woolly face surveyed the building's interior.

The building's door opened. They went out; and the guards took up their patrol, around the rim in opposite directions, keeping their eyes on Eldridge and their weapons ready in their hands. The building's door closed again. Outside, the flickering wall blinked out for a second and then returned again.

The silence of a warm, summer, mountain afternoon descended upon the building. The footsteps of the guards made shuffling noises on their path around the rim. The bars enclosed him.

Eldridge stood still, holding the bars in both hands and looking out.

He could not believe it.

He could not believe it as the days piled up into weeks, and the weeks into months. But as the seasons shift-

ed and the year came around to a new year, the realities of his situation began to soak into him like water into a length of dock piling. For outside, Time could be seen at its visible and regular motion; but in his prison, there was no Time.

Always, the lights burned overhead, always the guards paced about him. Always the barrier burned beyond the building, the meals came swinging in on the end of a long metal arm extended over the moat and through a small hatchway which opened automatically as the arm approached; regularly, twice weekly, the doctor came and checked him over, briefly, impersonally—and went out again with the changing of the guard.

He felt the unbearableness of his situation, like a hand winding tighter and tighter day by day the spring of tension within him. He took to pacing feverishly up and down the cage. He went back and forth, back and forth, until the room swam. He lay awake nights, staring at the endless glow of illumination from the ceiling. He rose to pace again.

The doctor came and examined him. He talked to Eldridge, but Eldridge would not answer. Finally there came a day when everything split wide open and he began to howl and bang on the bars. The guards were frightened and called the doctor. The doctor came, and with two others, entered the cage and strapped him down. They did something odd that hurt at the back of his neck and he passed out.

When he opened his eyes again, the first thing he saw was the doctor's woolly face, looking down at him—he had learned to recognize that countenance in the same way a sheep-hearder eventually comes to recognize individual sheep in his flock. Eldridge felt very weak, but calm.

"You tried hard—" said the doctor. "But you see, you didn't make it. There's no way out *that* way for you."

Eldridge smiled.

"Stop that!" said the doctor sharply. "You aren't fooling us. We know you're perfectly rational."

Eldridge continued to smile.

"What do you think you're doing?" demanded the doctor. Eldridge looked happily up at him.

"I'm going home," he said.

"I'm sorry," said the doctor. "You don't convince me." He turned and left. Eldridge turned over on his side and dropped off into the first good sleep he'd had in months.

In spite of himself, however, the doctor was worried. He had the guards doubled, but nothing happened. The days slipped into weeks again and nothing happened. Eldridge was apparently fully recovered. He still spent a great deal of time walking up and down his cage and grasping the bars as if to pull them out of the way before him—but the frenzy of his earlier pacing was gone. He had also moved his cot over next to the small, two-foot square, hatch that opened to admit

the mechanical arm bearing his meals, and would lie there, with his face pressed against it, waiting for the food to be delivered. The doctor felt uneasy, and spoke to the commander privately about it.

"Well," said the commander, "just what is it you suspect?"

"I don't know," confessed the doctor. "It's just that I see him more frequently than any of us. Perhaps I've become sensitized—but he bothers me."

"Bothers you?"

"Frightens me, perhaps. I wonder if we've taken the right way with him."

"We took the only way." The commander made the little gesture and sound that was his race's equivalent of a sigh. "We must have data. What do you do when you run across a possibly dangerous virus, doctor? You isolate it—for study, until you know. It is not possible, and too risky to try to study his race at close hand, so we study him. That's all we're doing. You lose objectivity, doctor. Would you like to take a short vacation?"

"No," said the doctor, slowly.

"No. But he frightens me."

Still, time went on and nothing happened. Eldridge paced his cage and lay on his cot, face pressed to the bars of the hatch, and staring at the outside world. Another year passed; and another. The double guards were withdrawn. The doctor came reluctantly to the conclusion that the human had at last accepted

the fact of his confinement and felt growing within him that normal sort of sympathy that feeds on familiarity. He tried to talk to Eldridge on his regularly scheduled visits, but Eldridge showed little interest in conversation. He lay on the cot watching the doctor as the doctor examined him, with something in his eyes as if he looked on from some distant place in which all decisions were already made and finished.

"You're as healthy as ever," said the doctor, concluding his examination. He regarded Eldridge. "I wish you would, though. . . ." He broke off. "We aren't a cruel people, you know. We don't like the necessity—that makes us do this."

He paused. Eldridge considered him without stirring.

"If you'd accept that fact," said the doctor, "I'm sure you'd make it easier on yourself. Possibly our figures of speech have given you a false impression. We said you are immortal. Well, of course, that's not true. Only practically speaking, are you immortal. You are now capable of living a very, very, very long time. That's all."

He paused again. After a moment of waiting, he went on.

"Just the same way, this business isn't really intended to go on for eternity. By its very nature, of course, it can't. Even races have a finite lifetime. But even that would be too long. No, it's just a matter of a long time as you might live it. Eventually, everything must come to a conclusion—that's inevitable."

Eldridge still did not speak. The doctor sighed.

"Is there anything you'd like?" he said. "We'd like to make this as little unpleasant as possible. Anything we can give you?"

Eldridge opened his mouth.

"Give me a boat," he said. "I want a fishing rod. I want a bottle of applejack."

The doctor shook his head sadly. He turned and signaled the guards. The cage door opened. He went out.

"Get me some pumpkin pie," cried Eldridge after him, sitting up on the cot and grasping the bars as the door closed. "Give me some green grass in here."

The doctor crossed the bridge. The bridge was lifted up and the monitor screen lit up. A woolly face looked out and saw that all was well. Slowly the outer door swung open.

"Get me some pine trees!" yelled Eldridge at the doctor's retreating back. "Get me some plowed fields! Get me some earth, some dirt, some plain, earth dirt! *Get me that!*"

The door shut behind the doctor; and Eldridge burst into laughter, clinging to the bars, hanging there with glowing eyes.

"I would like to be relieved of this job," said the doctor to the commander, appearing formally in the latter's office.

"I'm sorry," said the commander. "I'm very sorry. But it was our tactical team that initiated this action; and no one has the experience with the prisoner you have. I'm sorry."

The doctor bowed his head; and went out.

Certain mild but emotion-deadening drugs were also known to the woolly, bearlike race. The doctor went out and began to indulge in them. Meanwhile, Eldridge lay on his cot, occasionally smiling to himself. His position was such that he could see out the window and over the weaving curtain of the barrier that ringed his building, to the landing field. After a while one of the large ships landed and when he saw the three members of its crew disembark from it and move, antlike off across the field toward the buildings at its far end, he smiled again.

He settled back and closed his eyes. He seemed to doze for a couple of hours and then the sound of the door opening to admit the extra single guard bearing the food for his three o'clock mid-afternoon feeding. He sat up, pushed the cot down a ways, and sat on the end of it, waiting for the meal.

The bridge was not extended—that happened only when someone physically was to enter his cage. The monitor screen lit up and a woolly face watched as the tray of food was loaded on the mechanical arm. It swung out across the acid-filled moat, stretched itself toward the cage, and under the vigilance of the face in the monitor, the two-foot square hatch opened just before it to let it extend into the cage.

Smiling, Eldridge took the tray. The arm withdrew, as it cleared the

cage, the hatch swung shut and locked. Outside the cage, guards, food carrier and face in the monitor relaxed. The food carrier turned toward the door, the face in the monitor looked down at some invisible control board before it and the outer door swung open.

In that moment, Eldridge moved.

In one swift second he was on his feet and his hands had closed around the bars of the hatch. There was a single screech of metal, as—
incredibly—he tore it loose and threw it aside. Then he was diving through the hatch opening.

He rolled head over heels like a gymnast and came up with his feet standing on the inner edge of the moat. The acrid scent of the acid faintly burnt at his nostrils. He sprang forward in a standing jump, arms outstretched—and his clutching fingers closed on the end of the food arm, now halfway in the process of its leisurely mechanical retraction across the moat.

The metal creaked and bent, dipping downward toward the acid, but Eldridge was already swinging onward under the powerful impetus of his arms from which the sleeves had fallen back to reveal bulging ropes of smooth, powerful muscle. He flew forward through the air, feet first, and his boots took the nearest guard in the face, so that they crashed to the ground together.

For a second they rolled entangled, then the guard flopped and Eldridge came up on one knee, holding the black tube of the guard's weapon.

It spat a single tongue of flame and the other guard dropped. Eldridge thrust to his feet, turning to the still-open door.

The door was closing. But the panicked food-carrier, unarmed, had turned to run. A bolt from Eldridge's weapon took him in the back. He fell forward and the door jammed on his body. Leaping after him, Eldridge squeezed through the remaining opening.

Then he was out under the free sky. The sounds of alarm screechers were splitting the air. He began to run—

The doctor was already drugged—but not so badly that he could not make it to the field when the news came. Driven by a strange perversity of spirit, he went first to the prison to inspect the broken hatch and the bent food arm. He traced Eldridge's outward path and it led him to the landing field where he found the commander and the academician by a bare, darkened area of concrete. They acknowledged his presence by little bows.

"He took a ship here?" said the doctor.

"He took a ship here," said the commander.

There was a little silence between them.

"Well," said the academician, "we have been answered."

"Have we?" the commander looked at them almost appealingly. "There's no chance—that it was just chance? No chance that the hatch

just happened to fail—and he acted without thinking, and was lucky?”

The doctor shook his head. He felt a little dizzy and unnatural from the drug, but the ordinary processes of his thinking were unimpaired.

“The hinges of the hatch,” he said, “were rotten—eaten away by acid.”

“Acid?” the commander stared at him. “Where would he get acid?”

“From his own digestive processes—regurgitated and spat directly into the hinges. He secreted hydrochloric acid among other things. Not too powerful—but over a period of time. . . .”

“Still—” said the commander, desperately, “I think it must have been more luck than otherwise.”

“Can you believe that?” asked the academician. “Consider the timing of it all, the choosing of a moment when the food arm was in the proper position, the door open at the proper angle, the guard in a vulnerable situation. Consider his unhesitating and sure use of a weapon—which could only be the fruits of hours of observation, his choice of a moment when a fully supplied ship, its drive unit not yet cooled down, was waiting for him on the field. No,” he shook his woolly head, “we have been answered. We put him in an escape-proof prison and he escaped.”

“But none of this was impossible!” cried the commander.

The doctor laughed, a fuzzy, drug-blurred laugh. He opened his mouth but the academician was before him.

“It’s not what he did,” said the

academician, “but the fact that he did it. No member of another culture that we know would have even entertained the possibility in their minds. Don’t you see—he disregarded, he *denied* the fact that escape was impossible. *That* is what makes his kind so fearful, so dangerous. The fact that something is impossible presents no barrier to their seeking minds. That, alone, places them above us on a plane we can never reach.”

“But it’s a false premise!” protected the commander. “They cannot contravene natural laws. They are still bound by the physical order of the universe.”

The doctor laughed again. His laugh had a wild quality. The commander looked at him.

“You’re drugged,” he said.

“Yes,” choked the doctor. “And I’ll be more drugged. I toast the end of our race, our culture, and our order.”

“Hysteria!” said the commander.

“Hysteria?” echoed the doctor.

“No—*guilt!* Didn’t we do it, we three? The legend told us not to touch them, not to set a spark to the explosive mixture of their kind. And we went ahead and did it, you, and you, and I. And now we’ve sent forth an enemy—safely into the safe hiding place of space, in a ship that can take him across the galaxy, supplied with food to keep him for years, rebuilt into a body that will not die, with star charts and all the keys to understand our culture and locate his home again, using the

ability to learn we have encouraged in him."

"I say," said the commander, doggedly, "he is not that dangerous—yet. So far he has done nothing one of us could not do, had we entertained the notion. He's shown nothing, nothing supernatural."

"Hasn't he?" said the doctor thickly. "What about the defensive screen—our most dangerous most terrible weapon—that could burn him to nothingness if he touched it?"

The commander stared at him.

"But—" said the commander. "The screen was shut off, of course, to let the food carrier out, at the same time the door was opened. I assumed—"

"I checked," said the doctor, his eyes burning on the commander. "They turned it on again before he could get out."

"But he *did* get out! You don't mean . . ." the commander's voice faltered and dropped. The three stood caught in a sudden silence like stone. Slowly, as if drawn by strings controlled by an invisible hand, they turned as one to stare up into the empty sky and space beyond.

"You mean—" the commander's voice tried again, and died.

"Exactly!" whispered the doctor.

Halfway across the galaxy, a child of a sensitive race cried out in its sleep and clutched at its mother.

"I had a bad dream," it whimpered.

"Hush," said its mother. "Hush." But she lay still, staring at the ceiling. She, too, had dreamed.

Somewhere, Eldridge was smiling at the stars.

THE END

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Sworn to and subscribed before me this 30th day of September, 1957. William A. Norris, Jr., Notary Public. No. 30-8158000, Nassau County. (My commission expires March 30, 1958.)

CITIZEN OF THE GALAXY

Conclusion. The chains of a slave are put on from the outside; they can be broken, and the slave win to freedom. But there's a different kind of binding that's anchored where no man can break it...and such men are slaves beyond rescue!

BY ROBERT A. HEINLEIN

Illustrated by van Dongen

SYNOPSIS

A slave auction was going on in the Great Plaza of Jubbulpore. The merchandise now on the block was almost worthless—a young boy, starved and covered with sores, feral from too many masters and too many whips, ground-sick after light-years in the hold of a slaver. The auctioneer knocked down this damaged chattel for small change to an old beggar, rather than annoy nobles and ladies by holding up the sale.

BASLIM THE BEGGAR (one-eyed, one-legged, gaunt and aged) took his slave home to a burrow under the ruins of the old amphitheater.

He washed, bandaged, and fed the child, won his confidence, learned that his name was THORBY—but that was all, for THORBY, even under hypnosis, knew nothing of his people or his planet. His only identification was a slave-factor's serial number tattooed on a thigh. Years of abuse had made the boy jumpy as a stray dog, beset by nightmares; BASLIM slowly straightened him out with hypnotherapy and firm kindness.

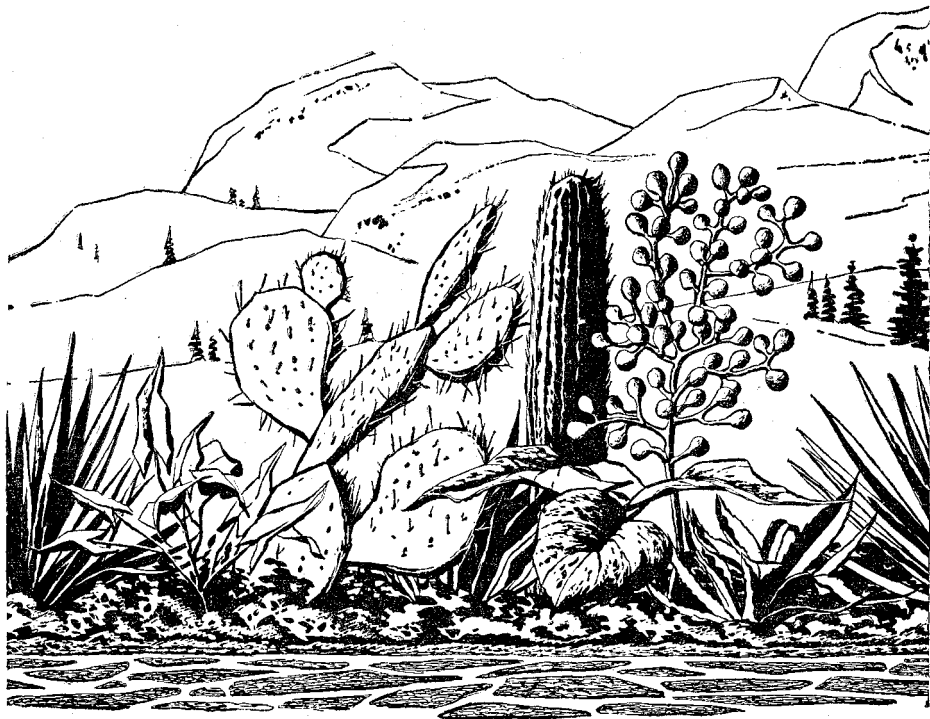
BASLIM trained THORBY as a beggar. Daily they made their pitch together in the Great Plaza of Jubbulpore.

Jubbulpore is a metropolis almost

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CITIZEN OF THE GALAXY

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unknown to civilization; there has been little or no intercourse with any of the Nine Worlds since they broke with the mother planet. But Jubulpore is the Sargon's capital and is a big and bustling place, technically advanced and politically decadent, corrupt throughout.

As a beggar **THORBY** learned the ways of an underworld, but in the privacy of their hideaway **BASLIM** taught him many other things—languages, mathematics, science, history, and galactography. **BASLIM** sternly and forcefully required **THORBY** to study and helped him

along both through advanced training aids and through the ancient Ter-ran mental discipline of "renshaw-ing." Under such tutoring **THORBY** acquired an exceptionally broad education.

THORBY was too young when this started to see anything strange in a penniless old beggar owning expensive teaching equipment, or in his being able to tutor complex subjects. As the years passed he gradually became aware of these contradictions but they did not worry him—Pop was Pop and could do anything. **THORBY** made the same adjustment



to his discovery that Pop had other activities besides begging, business which took him out at night disguised as a nobleman, complete with false leg, false eye, and finery. Anyone more sophisticated would have known that BASLIM was engaged in something illegal and probably treasonable to the Sargon; to THORBY, anything Pop did was all right. BASLIM—or "Pop"—was the foundation of his world.

BASLIM used THORBY as a secret courier inside the city and also to deliver messages to skippers of FREE TRADERS, tramp merchant

starships which visit not only ports of the Nine Worlds but also ports throughout the frontiers of the explored sector of the galaxy including colony worlds of the Terran Hegemony. BASLIM tried to arrange to have THORBY shipped out to a free world via one of these tramp ships, but THORBY bitterly refused—he did not want to leave Pop.

BASLIM was much worried about what would happen to his adopted son on his death. Unable to persuade the boy to leave him, he took two steps: he granted his slave manumission and had him recorded as a freedman—and he implanted in THORBY a message which must be delivered to any one of five skippers of FREE TRADERS after BASLIM'S death. The message was in a language not known to THORBY; the old man used hypnopedia to make him letter perfect.

When THORBY had reached gangling adolescence, man-tall but not filled out, a dust-up occurred in which he was almost captured by the Sargon's police while trying to deliver one of BASLIM'S secret messages to a man in the Sargon's starship dockyards. The incident did not worry THORBY—as a gutter rat a brush with the snoopies was all in the day's work to him—but it caused the old beggar to hurry home and start destroying records. That night he implanted a very long message in code in the boy's brain by hypnopedia.

The next day BASLIM was ab-

sent; THORBY made his pitch in the Plaza alone. For years it had always been his responsibility, in Pop's absence, to keep careful track of slave auctions and of the arrivals and departures of starships, especially slavers. That day the Free Trader SISU grounded; it was not a slaver but its skipper was one of the five to whom THORBY must deliver a message—someday, when BASLIM was dead. THORBY decided to go home and tell Pop of its arrival.

He found the ruins in which they lived staked out by police; THORBY evaded them and reached their underground home. It had been searched and wrecked—and Pop's false leg lay smashed on the floor.

Once the first stunning shock had worn off THORBY undertook the impossible task of finding Pop and freeing him from the Sargon's police. He sneaked back to the honky-tonk area between the Plaza and the spaceport—only to receive a worse shock there, for he learned that BASLIM was already dead, having suicided before the police could question him.

The additional fact that there was now a reward out on THORBY'S head as well hardly made an impression on him—save that he must, somehow, avoid arrest until he could deliver BASLIM'S message to the skipper of Starship SISU.

THORBY managed to hide with MOTHER SHAUM, disreputable owner of an even less reputable hotel; for the sake of her old friend BASLIM she arranged a meeting

with the skipper of the SISU. CAPTAIN KRAUSA was shocked and incredulous to hear that BASLIM was dead. He interrupted THORBY'S reciting of the message. "Is that true?"

"Is what true?" demanded MOTHER SHAUM. "I don't understand that jammer."

"Oh, sorry—it's my own language. The lad is telling me that an old beggar who called himself 'Baslim the Cripple' is dead. Well?"

"Oh. Of course it's true. And a sorry thing it is, too."

"Yes. It is." CAPTAIN KRAUSA looked at THORBY. "'Debts are always paid,'" he said slowly. "BASLIM says that I am to take you with me. Are you ready?"

THORBY gulped. "Yes, sir. If that's what Pop wanted."

MOTHER SHAUM looked shocked. "Are you two crazy? The street is crawling with police!"

MOTHER SHAUM, CAPTAIN KRAUSA, and much bribery got THORBY aboard the SISU—crated as a bale of verga leaves.

In only a few million miles THORBY became convinced that he had made a mistake. His stateroom in the Starship Sisu was luxurious and the food served to him there was wonderful—but nobody spoke to him; they looked right through him.

This was the lowest he had ever sunk. Even a slave has equals.

Sisu's only passenger DR. MARGARET MADER, an anthropologist from inside the Terran Hegemony, explained the matter to THORBY.

The FREE TRADERS are an in-group as tight and as proud as has ever been seen. They classify the human race as "The People" (themselves) and "fraki" (everybody else)—a term more insulting than "pig" or "louse" and carrying the connotation of "earthcrawler," one who never goes into space. Since THORBY himself was a "fraki" he was more thoroughly untouchable than a leper of Biblical times.

But before THORBY could fret too much about this he found himself suddenly and with impressive ritual adopted into "The People" as a foster son of CAPTAIN KRAUSA, by order of GRANDMOTHER KRAUSA, CHIEF OFFICER of Sisu, a grim bedridden old tyrant. Unknown to THORBY, BASLIM's message to CAPTAIN KRAUSA could be construed as a request to do this—and debts are always paid; Sisu always pays debts in full. So THORBY found himself not only no longer "fraki" but also fairly senior in the clan and sept of Sisu.

A FREE TRADER ship is organized both as a family and as a ship; both forms of organization are enormously important to "The People" and are complicated by ritualistic obligations and obligatory forms of address. The anthropologist DR. MARGARET MADER helped THORBY to get straightened out in these matters by letting him use the scientific notes and charts she had prepared—she then explained to him that these excessive formalities,

which the born members of Sisu family seemed to use almost by instinct, were the necessary lubrication of a society so artificial, so tightly packed into a ship, so constantly in each others' company, that without them they would be at each others' throats. As it was, Sisu was a smoothly working family and family business.

She pointed out to him that the laws of the People required a man to marry outside his immediate relatives but inside the People—THORBY could marry any female in the ship who had been adopted into it but not a female born inside the ship. She pointed out to him on the clan chart the females who were not taboo to him.

Her explanations greatly speeded up his understanding of the odd society he was in, but the notion that he was expected, eventually, to marry one of the non-taboo females just made him nervous. He had no time to worry, however, as he was put hard at work in training for fire-controlman on the starboard ballistic computer. The ships of "The People," like all starships, are powered by fusion reaction and are capable of enormous acceleration, necessary to let them get quickly up to speed-of-light and pass into irrational, multi-dimensional space. Since they operate out beyond the law of the Terran Hegemony there is always the possibility that they may be jumped, before reaching speed-of-light, by a bandit-slavetrader; the FREE TRADERS, like many before them in the

bloody history of the human race, are armed merchantmen.

The sound training BASLIM had given him in higher mathematics caused THORBY to be chosen for training for this awesome and indispensable job. His teacher was his foster nephew JERI KINGSOLVER, who, with his younger sister MATA, manned the starboard fire-control room. JERI and MATA were junior to THORBY in family rank, senior to him in ship's rank—and he was never allowed to forget either relationship. Worse than this, this pretty little girl who sat beside THORBY at gunnery drills was a crack fire-controlman, able to do easily and perfectly the almost-impossible problems of sub-light-speed ballistics—problems which THORBY was finding almost superhumanly difficult.

The grueling fact that MATA regularly beat THORBY at combat drill finally caused him to blow his top—and earned him nothing but a thorough eating-out by his nephew JERI and some extra drill. For days thereafter THORBY was stiffly formal with MATA and JERI—ships' ranks at drill, family ranks at other times, all behind a wall of ritual as prescribed in the Laws of Sisú.

Little MATA broke the ice by humbly asking her "uncle" to play spat ball with her one day during recreation hours. THORBY loosened up, got better at his work, spent much social time with MATA—and eventually qualified as a junior fire-controlman . . . and all three of

them got back on first-name terms again.

On the planet Losian, which is inhabited by nonhuman civilized creatures, THORBY's "FATHER" CAPTAIN KRAUSA took him dirt-side on a business trip and talked with him. CAPTAIN KRAUSA is worried because BASLIM's injunction had required him to try to identify this orphan boy and to restore him to his own blood by entrusting THORBY at first opportunity to a ship of the Hegemonic Guard—and it was now becoming evident to him that his mother, the CHIEF OFFICER, had no intention of parting with THORBY. THORBY was already old enough to be (barely) eligible for marriage; it would be confoundedly awkward if the lad married before he, KRAUSA, had a chance to carry out the rest of BASLIM's injunction!

But he could not speak of these matters to his foster son because the CHIEF OFFICER held a different opinion. CAPTAIN KRAUSA let it go with suggesting to THORBY that he not get himself tied down to one girl until he had a chance to meet other girls at the coming Great Gathering—an occasion at ten-year intervals when as many ships of the People as possible make rendezvous for business and pleasure.

This suited THORBY; he had no matrimonial intentions at all.

When they returned to the ship, THORBY found his foster nephew JERI acting glum; he demanded to know why.

"MATA has been swapped."

The news shocked THORBY.
"Why? When? What happened?"

"While you were dirtside. To El Nido, of course; she's the only ship of the People in port. Grandmother just swapped her—no warning at all."

"But why?"

JERI looked scornful. "You can't figure it out? You are the reason my sister got swapped!"

"Me?"

"Who else? She's been chasing you, you dim wit—and it's just not possible; it's taboo."

THORBY took his troubles to DR. MARGARET MADER, found her preparing to leave also; she was about to go home via El Nido. He got explanations from her, but little comfort. Yes, it was true that little MATA had been no blood relationship to him; nevertheless she was taboo under the laws of the People . . . and GRANDMOTHER KRAUSA had been perfectly right in shipping out a girl who seemed in danger of breaking the taboos. There was no such thing as a "little" break in taboo; the social system and the very safety of the ship lay in holding fast to their traditions. It did not matter that THORBY had never had any slightest intention toward MATA; the only safe thing to do was to place some light-years between them.

THORBY did not understand it and DR. MADER quit trying to explain. "I doubt if your Grandmother understands it either—she just knows

what is good for her family and her ship. THORBY . . . I once thought that you would adjust to this life. Now I'm not sure—you've been free too long. Freedom is a hard habit to break."

"Hub?"

"You've had violent dislocations. Your first foster father, BASLIM THE WISE, bought you as a slave and made you free, as free as he was. Now CAPTAIN KRAUSA, with the best intentions, adopted you and thereby made you a slave."

"Why, that's preposterous!"

"Is it? Oh, 'The People' are free . . . more free than the stars; this old galaxy has never seen such freedom. But at what price? I'll tell you: freedom itself. The People have bought freedom for themselves as a people at the price of the loss of individual freedom for each and every one of you. I am beginning to be afraid that you will never get used to it, THORBY; you've been free too long. If you ever find that you agree with me, wait until Sisu touches down at some planet that is free and democratic and human—then hit dirt and run! But do it before Grandmother decides to marry you off—because if you wait that long, you're lost!"

THORBY missed both MATA and DR. MADER, but there was so much work to do and so much to learn, so many interesting new planets to see, that they gradually faded from his mind. Sisu went skipping around the unmarked frontiers of the nine hundred light-year globe of

the Terran Hegemony, Losian, Finster, Thoth IV, Woolamurra . . . getting ever closer to Hekate where the Great Gathering of the People was to be held. The ship took on a feverish carnival air as preparations were made to support the great pride of Sisu among the many ships of the People. THORBY had no special talents; he would not represent his ship in the games, so he was drafted as an actor—to his utter amazement. He was picked for the leading role, that of the first CAPTAIN KRAUSA, generations back, in a play called "The Spirit of Sisu." Playing opposite him, as his "wife," was LOEEN GARCIA, a dark beauty received from El Nido in exchange for MATA.

It all upset THORBY very much, especially when the stage instructions required him to kiss LOEEN right in front of GRANDMOTHER and everybody—this was totally foreign to his experience. But GRANDMOTHER was pleased and that settled it.

THORBY had become an important man in another fashion; he had "burned" his first raider. The attack had come while the portside ballistic computer was out of service; the burden had fallen on THORBY alone, he had saved his ship and his family. A formal dinner, as required by custom, was held in his honor, but THORBY did not enjoy it—not only did it force him to eat with GRANDMOTHER KRAUSA—which scared him—but also he did not feel like a hero. THORBY suf-

fered from the common emotional conflict of believing that certain things—such as killing in self-defense—were necessary—but was nevertheless acutely distressed at the gory fact.

When the ship called at Woolamurra both THORBY and his foster father CAPTAIN KRAUSA were much disturbed. Woolamurra is precisely the sort of planet DR. MADER had suggested to THORBY: "... Hit dirt and run!" It is human, free, democratic, rich in natural resources, and even today so sparsely settled that any immigrant with two hands and a willingness to work is welcome . . . and THORBY had become uncomfortably aware that GRANDMOTHER was throwing LOEEN GARCIA at him quite as firmly as she had removed MATA from his neighborhood. DR. MADER's warning echoed in his ears. He had no wish to tie himself down, but he doubted his own ability to stand against GRANDMOTHER's iron will . . . and the situation was not made any safer by the fact that he actually did find LOEEN attractive.

CAPTAIN KRAUSA was worried by the same thing but for stronger reasons. He was aware that his mother was trying to weld THORBY to the ship by means of LOEEN—but also his conscience was hurting him because a Hegemonic Mail Courier was in port with them: under the injunction laid on him by BASLIM the lad should be transferred to it . . . and his mother would not listen to the idea. Under the matriarchal

customs of the People the chief officer bossed practically everything but the actual conning of the ship.

While the captain was trying to screw up his courage to buck his mother's will, THORBY was trying to make up his mind to desert—and decided that he could not; he owed too much to his foster father, too much to all of Sisu.

Their problems suddenly were changed if not resolved; GRAND-MOTHER died on Woolamurra . . . quietly in her sleep.

THORBY was surprised to find that this grim, tyrannical old woman, whom he had feared and never liked, had been the strength that held the ship together. Her death left him feeling lost . . . as was the case with his brothers, sisters, cousins, and kin. But THORBY's sweet and gentle foster mother succeeds to chief officer . . . and has, he discovered, the same stern stuff in her; Sisu does not die.

The ship left Woolamurra and joined the Great Gathering on Hekate. THORBY was swept up in the enormous carnival while his elders were equally busy with more serious matters of business, politics among the People, and the money problems of financing a new ship to let the clan Sisu expand—and CAPTAIN KRAUSA quickly learned that his new chief officer, his wife RHODA, was even tougher to handle than his mother had been. CAPTAIN KRAUSA took advantage of the Gathering to search the vital records of the People's flagship in hopes of

proving that THORBY was actually born among the People before he was stolen and enslaved—if he could prove this it would free him of the obligation to BASLIM to turn THORBY over to the Hegemonic Guard.

He was not successful. THORBY was not of the People; he was born fraki. The records proved it—and "Debts are always paid!"

RHODA KRAUSA was not impressed by this mere technicality; THORBY had been adopted into Sisu and it was utterly unthinkable to her that one of her sons should be turned over to fraki for any reason—and besides, she firmly intended to use THORBY politically to cause her husband to be elected commodore, or at least deputy commodore, of all the People . . . for the "debt that must be paid" is an important one to all the People: long ago BASLIM saved a FREE TRADER ship, the Hansea—and Sisu in adopting THORBY, BASLIM's foster son, had assumed the debt and had thereby placed every ship of the People under obligation to Sisu. RHODA KRAUSA intended to play this advantage for all it was worth.

And her husband just as stubbornly intended to carry out BASLIM's instructions to the letter.

He accomplished his purpose by sneaking THORBY away from the Gathering, over to Hekate's military port, and into the Guard Cruiser Hydra. Just before they reached the Hydra KRAUSA had THORBY recite again the message BASLIM had

long ago sent to KRAUSA—THORBY had not understood the language when he had first delivered it, but now he understood it and realized why his foster father had brought him here. With sudden great sorrow THORBY accepted BASLIM's plans for him.

CAPTAIN KRAUSA said to COLONEL BRISBY, commanding officer of Guard Cruiser Hydra, "Colonel, may I ask what year you graduated?..

.. "Eh?" The colonel was startled. "Oh-Eight. Why do you ask?"

"I think you can answer that. This lad is THORBY BASLIM, adopted son of COLONEL RICHARD BASLIM. The colonel asked me to deliver him to you."

The confusion this announcement produced in THORBY's brain was very great. Pop a colonel? A colonel in the fraki Hegemonic Guard? But Pop was BASLIM the Beggar, licensed mendicant under the mercy of...

BRISBY told him sharply to sit down. It kept him from fainting.

A day later THORBY found himself a freshly-enlisted boot guardsman, that being COLONEL BRISBY's solution to the complicated problem of how to accomplish an extensive identity search on him while keeping him aboard, all this to carry out the old beggar's wishes—for THORBY finally was forced to admit that Pop really had been a member of the Guard, impossible as it seemed. He cared little or nothing about finding his own family

but he was grateful at the chance to join Pop's old outfit.

THORBY realized almost at once that he must deliver to COLONEL BRISBY the coded message Pop had implanted in him by hypnosis just before he died. Decoded, the message was a detailed analysis of the slave trade in the Nine Worlds, its economic background, and its probable connections inside the Hegemony of Terra. COLONEL RICHARD BASLIM had been a dedicated man, one who hated slavery with a pure hatred. He had lost a leg and an eye in a raid which rescued a shipload of slaves—FREE TRADERS, the clan Hansea—then, unwilling to rest in retirement, had volunteered to do espionage for the Exotic Corps—and had spent his old age as BASLIM THE BEGGAR, gathering facts which could some day destroy the slave trade.

On authorization by the Exotic Corps—or "X" Corps—COLONEL BRISBY continued to question THORBY about BASLIM's methods, while the Hydra cruised toward Ultima Thule. In the meantime THORBY slowly became a Guardsman in fact and eventually was promoted to acting ordnanceman 3/c, largely because of his training in ballistics acquired in Sisu. At long last a report came back from Guard Supreme Headquarters on Terra: GUARDSMAN THORBY BASLIM cannot be identified in the vital records of any civilized planet and is not a native of Hekate as alleged in his enlistment papers; Hydra is di-

rected to transfer him to the nearest receiving station for retransfer to Hekate, for investigation, and disposition.

COLONEL BRISBY sadly called THORBY in and showed him the dispatch. BRISBY felt as if he had let BASLIM down—and THORBY felt stunned . . . lost and alone again, as if he were again about to be sold as a chattel, for he had come to believe BRISBY's assurances that his identification was just a matter of time.

While in this stunned condition THORBY got into a fight with another petty officer and was busted back to Guardsman 3/c.

Shortly thereafter BRISBY recalled one more possibility for identification—and sent in THORBY's footprints, the usual way of identifying a very young child before the full routine of fingerprints, retinal pattern, et cetera, has been accomplished.

This time a dispatch came back at once: GUARDSMAN THORBY BASLIM IDENTIFIED MISSING PERSON THOR BRADLEY RUDBEK TERRA NOT HEKATE TRANSFER RUDBEK FASTEST MILORCOM TERRA DISCHARGE ARRIVAL NEXTKIN NOTIFIED REPEAT FASTEST CHFBUPERS.

THORBY found himself almost immediately on fabulous, mythical Terra, a civilian, with a brand-new name and strange relatives.

Chief among his relatives were his grandparents BRADLEY, "UNCLE JACK" WEEMSBY, and his cousin LEDA, a comely young woman about

his age, whom he automatically classed as "taboo" just as MATA had been, since she is introduced as "Cousin." It was immediately evident to him that he must be in the sept of a wealthy family—probably even richer than Sisú. WEEMSBY and LEDA flew him to an enormous estate in Wyoming; the estate's name is Rudbek, the city nearest it is named Rudbek, and his own name is Rudbek, in fact his full name is "Rudbek of Rudbek at Rudbek." But this is a totally strange culture to him, so strange that he does not even know what questions to ask—so strange indeed that his cousin LEDA has never heard of the slave trade and simply cannot believe him when he says that he has been a slave and a beggar. The tattoo mark he shows her she finds confusing and very upsetting—so THORBY shuts up and keeps his ears open.

He is caught up in such a whirl of social life with LEDA and her young friends that other questions are pushed aside for a while . . . until one day, during a skiing party on the slopes of the Tetons near Rudbek Estate, one of the guests, a young man named JOEL DE LA CROIX, gets him aside. "Thor, I've got an idea that ought to make the firm money. Can I talk to you, after you take over?"

"After I take over?"

"Or later, at your convenience. I don't want to take it up with WEEMSBY—and, after all, you're the heir."

THORBY blinked. "I'll think

about it." He left and found LEDA, got her aside, told her what JOEL DE LA CROIX had said. "What did he mean?: 'When I take over.'"

"Why, you will, eventually."

"Take over what?"

"Why . . . why, everything." She gestured, including mountains, estate, Rudbek City. "All of it. Lots of things. Your personal things, like your sheep station in Australia and your house in Majorca and—oh, lots of things. And the business, of course. Rudbek Associates is many things, on many planets—I couldn't begin to list them. But, after all, you're Rudbek of Rudbek."

THORBY licked dry lips. *"Why wasn't I told?"*

PART 4

Leda looked distressed. "Thor dear! We've let you take your time. Daddy didn't want to worry you."

"Well," he said, "I'm worried now. I had better talk to Uncle Jack."

John Weemsby was at dinner but so were many guests. As they were leaving Weemsby motioned Thorby aside. "Leda tells me you're fretting."

"Not exactly. I want to know some things."

"You shall—I was hoping that you would tire of your vacation. Let's go to my study."

They went there; Weemsby dismissed his second-shift secretary and said, "Now what do you want to know?"

"I want to know," Thorby said slowly, "what it means to be 'Rudbek of Rudbek.'"

Weemsby spread his hands. "Everything . . . and nothing. You are titular head of the business, now that your father is dead . . . if he is."

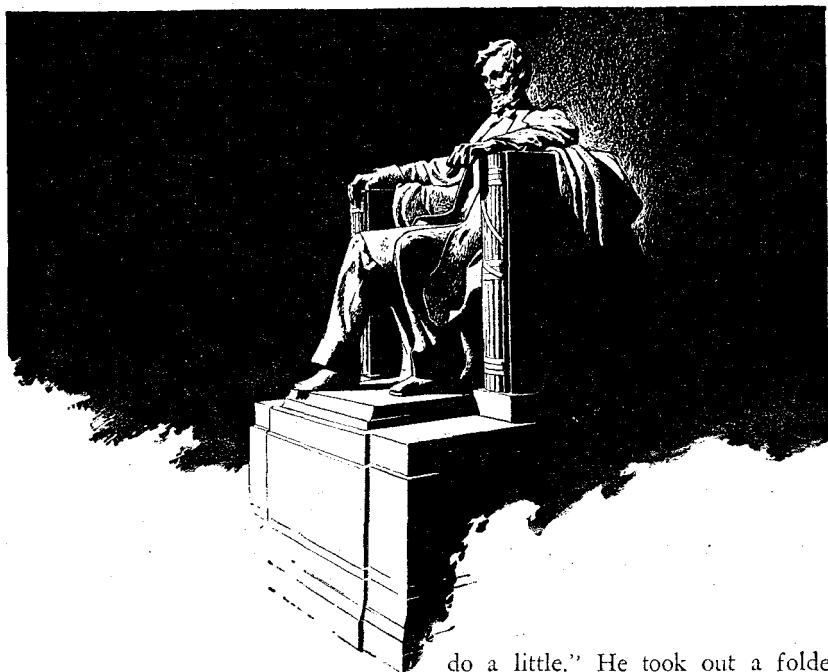
"Is there any doubt?"

"I suppose not. Yet you turned up."

"Supposing he is dead, what am I? Leda seems to think I own just about everything. What did she mean?"

Weemsby smiled. "You know girls. No head for business. The ownership of our enterprises is spread around—most of it is in our employees. But, if your parents are dead, you come into stock in Rudbek Associates, which in turn has an interest in—sometimes a controlling interest—in other things. I couldn't describe it now. I'll have the legal staff do it—I'm a practical man, too busy making decisions to worry about who owns every share. But that reminds me . . . you haven't had a chance to spend much money, but you might want to." Weemsby opened a drawer, took out a pad. "There's a megabuck. Let me know if you run short."

Thorby thumbed through it. Teran currency did not bother him: a hundred dollars to the credit—which he thought of as five loaves of bread, a trick the Supercargo taught him—a thousand credits to the supercredit, a thousand supercredits to the megabuck. So simple that the People trans-



lated other currencies into it, for accounting.

But each sheet was ten thousand credits . . . and there were a hundred sheets. "Did I . . . inherit this?"

"Oh, that's just spending money—checks, really. You convert them at dispensers in stores or banks. You know how?"

"No."

"Don't get a thumbprint on the sensitized area until you insert it in the dispenser. Have Leda show you—if that girl could make money the way she spends it, neither you nor I would have to work. But," Weemsby added, "since we do, let's

do a little." He took out a folder and spread papers. "Although this isn't hard. Just sign at the bottom of each, put your thumbprint by it, and I'll call Beth in to notarize. Here, we can open each one to the last page. I had better hold 'em—the consarned things curl up."

Weemsby held one for Thorby's signature. Thorby hesitated, then instead of signing, reached for the document. Weemsby held on. "What's the trouble?"

"If I'm going to sign, I ought to read it." He was thinking of something Grandmother used to be downright boring about.

Weemsby shrugged. "They are routine matters that Judge Bruder

prepared for you." Weemsby placed the document on the others, tidied the stack, and closed the folder. "These papers tell me to do what I have to do anyway. Somebody has to do the chores."

"Why do I have to sign?"

"This is a safety measure."

"I don't understand."

Weemsby sighed. "The fact is, you don't understand business. No one expects you to; you haven't had any chance to learn. But that's why I have to keep slaving away; business won't wait." He hesitated. "Here's the simplest way to put it. When your father and mother went on a second honeymoon, they had to appoint someone to act while they were gone. I was the natural choice, since I was their business manager and your grandfather's before that—he died before they went away. So I was stuck with it while they went jaunting. Oh, I'm not complaining; it's not a favor one would refuse a member of the family. Unfortunately they did not come back, so I was left holding the baby.

"But now *you* are back and we must make sure everything is orderly. First it is necessary for your parents to be declared legally dead—that must be done before you can inherit. That will take a while. So here I am, *your* business manager, too—manager for all the family—and I don't have anything from you telling me to act. These papers do that."

Thorby scratched his cheek. "If I haven't inherited yet, why do you need anything from me?"

Weemsby smiled. "I asked that myself. Judge Bruder thinks it is best to tie down all possibilities. Now since you are of legal age—"

"Legal age?" Thorby had never heard the term; among the People, a man was old enough for whatever he could do.

Weemsby explained. "So, since the day you passed your eighteenth birthday, you have been of legal age, which simplifies things—it means you don't have to become a ward of a court. We have your parents' authorizations; now we add yours—and then it doesn't matter how long it takes the courts to decide that your parents are dead, or to settle their wills. Judge Bruder and I and the others who have to do the work can carry on without interruption. A time gap is avoided . . . one that might cost the business many megabucks. Now do you understand?"

"I think so."

"Good. Let's get it done." Weemsby started to open the folder.

Grandmother always said to read before signing—then think it over.

"Uncle Jack, I want to read them."

"You wouldn't understand them."

"Probably not." Thorby picked up the folder. "But I've got to learn."

Weemsby reached for the folder. "It isn't necessary."

Thorby felt a surge of obstinacy. "Didn't you say Judge Bruder prepared these for me?"

"Yes."

"Then I want to take them to my apartment and try to understand them. If I'm 'Rudbek of Rudbek' I

ought to know what I'm doing."

Weemsby hesitated, then shrugged. "Go ahead. You'll find that I'm simply trying to do for you what I have always been doing."

"But I still ought to understand what I'm doing."

"Very well! Good night."

Thorby read till he fell asleep. The language was baffling but the papers did seem to be what Uncle Jack said they were—instructions to John Weemsby to continue the routine business of a complex set-up. He fell asleep full of terms like "full power of attorney," "all manners of business," "receive and pay monies," "revocable only by mutual consent," "waiver of personal appearance," "full faith and credence," and "voting proxy in all stockholding and/or directorial meetings, special or annual."

As he dozed off it occurred to him that he had not asked to see the authorizations given by his parents.

Sometime during the night he seemed to hear Grandmother's impatient voice: "*... Then think it over! If you don't understand it, and the laws under which it will be executed, then don't sign it!—no matter how much profit may appear to be in store. Too lazy and too eager can ruin a trader.*"

He stirred restlessly.

XVIII

Hardly anyone came down for breakfast in Rudbek. But breakfast in bed was not in Thorby's training;

he ate alone in the garden, luxuriating in hot mountain sunshine and lush tropical flowers while enjoying the snowy wonderland around him. Snow fascinated him—he had never dreamed that anything could be so beautiful.

But the following morning Weemsby came into the garden only moments after Thorby sat down. A chair was placed under Weemsby; a servant quickly laid a place. He said, "Just coffee. Good morning, Thor."

"Good morning, Uncle Jack."

"Well, did you get your studying done?"

"Sir? Oh, yes. That is, I fell asleep reading."

Weemsby smiled. "Lawyerese is soporific. Did you satisfy yourself that I had told you correctly what they contained?"

"Uh, I think so."

"Good." Weemsby put down his coffee and said to a servant, "Hand me a house phone. Thor, you irritated me last night."

"I'm sorry, sir."

"But I realize you were right. You should read what you sign—I wish I had time to! I have to accept the word of my staff in routine matters or I would never have time for policy . . . and I assumed that you would do the same with me. But caution is commendable." He spoke into the phone. "Carter, fetch those papers from Rudbek's apartment. The garden."

Thorby wondered if Carter could find the stuff—there was a safe in his study but he had not learned to

use it, so he had hidden the papers behind books. He started to mention it but Uncle Jack was talking.

"Here is something you will want to see . . . an inventory of real property you own—or will own, when the wills are settled. These holdings are unconnected with the business."

Thorby looked through it with amazement. Did he really own an island named Pitcairn at fifteen something south and a hundred and thirty west—whatever that meant? A dome-home on Mars? A shooting lodge in Yukon—where was "Yukon" and why shoot there? You ought to be in free space to risk shooting. And what were all these other things?

He looked for one item. "Uncle Jack? How about Rudbek?"

"Eh? You're sitting on it."

"Yes . . . but do I own it? Leda said I did."

"Well, yes. But it's entailed—that means your great great grandfather decided that it should never be sold . . . so that there would always be a Rudbek at Rudbek."

"Oh."

"I thought you might enjoy looking over your properties. I've ordered a car set aside for you. Is that one we hopped here in satisfactory?"

"What? Goodness, yes!" Thorby blinked.

"Good. It was your mother's and I've been too sentimental to dispose of it. But it has had all latest improvements added. You might persuade Leda to hop with you; she is familiar with most of that list. Take some young friends along and

make a picnic of it, as long as you like. We can find a congenial chaperone."

Thorby put the list down. "I probably will, Uncle Jack . . . presently. But I ought to get to work."

"Eh?"

"How long does it take to learn to be a lawyer here?"

Weemsby's face cleared. "I see. Lawyers' quaint notions of language can shock a man. It takes four or five years."

"It does?"

"The thing for you is two or three years at Harvard or some other good school of business."

"I need that?"

"Definitely."

"Uh . . . you know more about it than I do—"

"I should! By now."

". . . But couldn't I learn something about the business before I go to school? I haven't any idea what it is."

"Plenty of time."

"But I want to learn *now*."

Weemsby started to cloud, then smiled and shrugged. "Thor, you have your mother's stubbornness. All right, I'll order a suite for you at the main office in Rudbek City—and staff it with people to help you. But I warn you, it won't be fun. Nobody owns a business; the business owns him. You're a slave to it."

"Well . . . I ought to try."

"Commendable spirit." The phone by Weemsby's cup blinked; he picked it up, frowned, said, "Hold on." He

turned to Thorby. "That idiot can't find those papers."

"I meant to tell you. I hid them—I didn't want to leave them out."

"I see. Where are they?"

"Uh, I'll have to dig them out."

Weemsby said in the phone, "Forget it." He tossed the phone to a servant and said to Thorby, "Then fetch them, if you don't mind."

Thorby did mind. So far he had had four bites; it annoyed him to be told to run an errand while eating. Besides . . . was he "Rudbek of Rudbek?" or still messenger for the weapons officer? "I'll be going up after breakfast."

Uncle Jack looked vexed. But he answered, "I beg your pardon. If you can't tear yourself away, would you please tell *me* where to find them? I have a hard day ahead and I would like to dispose of this triviality and go to work. *If* you don't mind."

Thorby wiped his mouth. "I would rather not," he said slowly, "sign them now."

"What? You told me that you had satisfied yourself."

"No, sir, I told you that I had read them. But I don't understand them. Uncle Jack, where are the papers that my parents signed?"

"Eh?" Weemsby looked at him sharply. "Why?"

"I want to see them."

Weemsby considered. "They must be in the vault at Rudbek City."

"All right. I'll go there."

Weemsby suddenly stood up. "If you will excuse me, I'll go to work," he snapped. "Young man, some day

you will realize what I have done for you! In the meantime, since you choose to be unco-operative, I still must get on with my duties."

He left abruptly. Thorby felt hurt—he didn't want to be unco-operative . . . but if they had waited for years, why couldn't they wait a little longer and give him a chance?

He recovered the papers, then phoned Leda. She answered, with vision switched off. "Thor dear, what are you doing up in the middle of the night?"

He explained that he wanted to go to the family's business offices. "I thought maybe you could direct me."

"You say Daddy said to?"

"He's going to assign me an office."

"I won't just direct you; I'll take you. But give a girl a chance to get a face on and swallow orange juice."

He discovered that Rudbek was connected with their offices in Rudbek City by high-speed sliding tunnel. They arrived in a private foyer guarded by an elderly receptionist. She looked up. "Hello, Miss Leda! How nice to see you!"

"You, too, Aggie. Will you tell Daddy we're here?"

"Of course." She looked at Thorby.

"Oh," said Leda. "I forgot. This is Rudbek of Rudbek."

Aggie jumped to her feet. "Oh, dear me! I didn't *know*—I'm sorry, sir!"

Things happened quickly. In minutes Thorby found himself with an office of quiet magnificence, with a

quietly gorgeous secretary who addressed him by his double-barreled title but expected him to call her "Dolores." There seemed to be unlimited genies ready to spring out of walls at a touch of her finger.

Leda stuck with him until he was installed, then said, "I'll run along, since you insist on being a dull old business man." She looked at Dolores. "Or will it be dull? Perhaps I should stay." But she left.

Thorby was intoxicated with being immensely wealthy and powerful. Top executives called him "Rudbek," junior executives called him "Rudbek of Rudbek," and those still more junior crowded their words with "sirs"—he could judge status by how he was addressed.

While he was not yet active in business—he saw Weemsby rarely and Judge Bruder almost never—anything he wanted appeared quickly. A word to Dolores and a respectful young man popped in to explain legal matters; another word and an operator appeared to show moving stereocolor of business interests anywhere, even on other planets. He spent days looking at such pictures, yet still did not see them all.

His office became so swamped with books, spools, charts, brochures, presentations, file jackets, and figures, that Dolores had the office next door refitted as a library. There were figures on figures, describing in fiscal analogue enterprises too vast to comprehend otherwise. There were so many figures, so intricately related,

that his head ached. He began to have misgivings about the vocation of tycoon. It wasn't all just being treated with respect, going through doors first, and always getting what you asked for. What was the point if you were so snowed under that you could not enjoy it? Being a Guardsman was easier.

Still, it was nice to be important. Most of his life he had been nobody, and at best he had been very junior.

If only Pop could see him now!—surrounded by lavish furnishings, a barber to trim his hair while he worked—Pop used to cut it under a bowl—a secretary to anticipate his wishes, and dozens of people eager to help. But Pop's face in this dream was wearing Pop's reproving expression; Thorby wondered what he had done wrong, and dug harder into the mess of figures.

Eventually a pattern began to emerge. The business was Rudbek & Associates, Ltd. So far as Thorby could tell this firm did nothing. It was chartered as a private investment trust and just owned things. Most of what Thorby would own, when his parents' wills were probated, was stock in this company. Nor would he own it all; he felt almost poverty-stricken when he discovered that mother and father together held only eighteen per cent of many thousand shares.

Then he found out about "voting" and "non-voting"; the shares coming to him were eighteen/fortieths of the voting shares; the remainder was

split between relatives and nonrelatives.

Rudbek & Associates owned stock in other companies—and here it got complicated. Galactic Enterprises, Galactic Acceptance Corporation, Galactic Transport, Interstellar Metals, Three Planets Fiscal (which operated on twenty-seven planets), Havermeyer Laboratories (which ran barge lines and bakeries as well as research stations)—the list looked endless. These corporations, trusts, cartels, and banking houses seemed as tangled as spaghetti. Thorby learned that he owned—through his parents—an interest in a company called “Honace Bros., Pty.” through a chain of six companies—18% of 31% of 43% of 19% of 44% of 27%, a share so microscopic that he lost track. But his parents owned directly seven per cent of Honace Brothers—with the result that his indirect interest of one-twentieth of one per cent controlled it utterly but paid little return, whereas seven per cent owned directly did not control—but paid one hundred and forty times as much.

It began to dawn on him that control and ownership were only slightly related; he had always thought of “ownership” and “control” as being the same thing; you owned a thing, a begging bowl, or a uniform jacket—of course you controlled it!

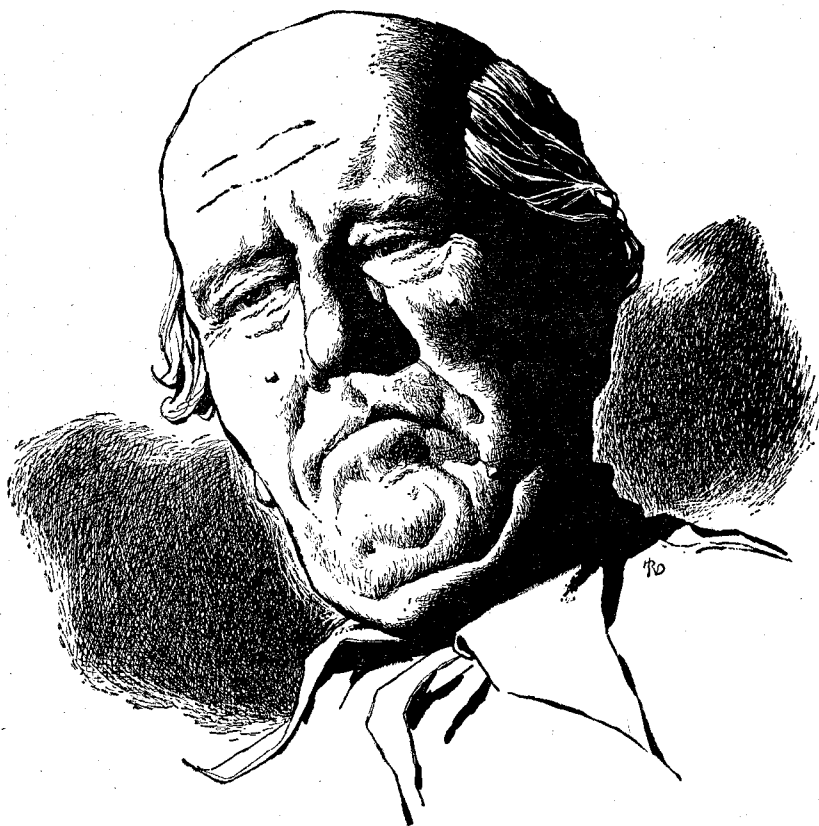
The converging, diverging, and crossing of corporations and companies confused and disgusted him.

It was as complex as a fire-control computer without a computer's cool logic. He tried to draw a chart and could not make it work. The ownership of each entity was tangled in common stocks, preferred stocks, bonds, senior and junior issues, securities with odd names and unknown functions; sometimes one company owned a piece of another directly and another piece through a third, or two companies might each own a little of the other, or sometimes a company owned part of itself in a tail-swallowing fashion. It didn't make sense.

This wasn't “business”—what the People did was *business* . . . buy, sell, make a profit. But this was a silly game with wild rules.

Something else fretted him. He had not known that Rudbek built spaceships. Galactic Enterprises controlled Galactic Transport, which built ships in one of its many divisions. When he realized it he felt a glow of pride, then discovered gnawing uneasiness — something Colonel Brisby had said . . . something Pop had proved: that the “largest” or it might have been “one of the largest” builders of starships was mixed up in the slave trade.

He told himself he was being silly —this beautiful office was about as far from the dirty business of slave traffic as anything could be. But as he was dropping to sleep one night he came wide awake with the black, ironic thought that one of those slave ships in whose stinking holds he had ridden might have been, at that



very time, the property of the scabby, frightened slave he was then.

It was a nightmare notion; he pushed it away. But it took the fun out of what he was doing.

One afternoon he sat studying a long memorandum from the legal department—a summary, so it said, of Rudbek & Associates' interests—and found that he had dragged to a halt. It seemed as if the writer had gone out of his way to confuse things. It would have been as intel-

ligible in ancient Chinese—more so; Sargonese included many Mandarin words.

He sent Dolores out and sat with his head in his hands. Why, oh, why hadn't he been left in the Guard? He had been happy there; he had understood the world he was in.

Then he straightened up and did something he had been putting off; he returned a vucall from his grandparents. He had been expected to visit them long since, but he had felt

compelled to try to learn his job first.

Indeed he was welcome! "Hurry, son—we'll be waiting." It was a wonderful hop across prairie and the mighty Mississippi—small from that height—and over city-pocked farm land to the sleepy college town of Valley View, where sidewalks were stationary and time itself seemed slowed. His grandparents' home, imposing for Valley View, was homey after the awesome halls of Rudbek.

But the visit was not relaxing. There were guests at dinner, the president of the college and department heads, and many more after dinner—some called him "Rudbek of Rudbek," other addressed him uncertainly as "Mr. Rudbek," and still others, smug with misinformation as to how the nabob was addressed by familiars, simply as "Rudbek." His grandmother twittered around, happy as only a proud hostess can be, and his grandfather stood straight and addressed him loudly as "Son."

Thorby did his best to be a credit to them. He soon realized that it was not what he said but the fact of talking to Rudbek that counted.

The following night, which his grandmother reluctantly kept private, he got a chance to talk. He wanted advice.

First information was exchanged. Thorby learned that his father, on marrying the only child of his grandfather Rudbek, had taken his wife's family name. "It's understandable,"

Grandfather Bradley told him. "Rudbek has to have a Rudbek. Martha was heir but Creighton had to pre-
side—board meetings and conferences and at the dinner table for that matter. I had hoped that my son would pursue the muse of history, as I have. But when this came along, what could I do but be happy for him?"

His parents and Thorby himself had been lost as a consequence of his father's earnest attempt to be in the fullest sense Rudbek of Rudbek—he had been trying to inspect as much of the commercial empire as possible. "Your father was always conscientious and when your Grandfather Rudbek died before your father completed his apprenticeship, so to speak, Creighton left John Weemsby in charge—John is, I suppose you know, the second husband of your other grandmother's youngest sister Aria—and Leda, of course, is Aria's daughter by her first marriage."

"No, I hadn't known." Thorby translated the relationships into *Sissu* terms . . . and reached the startling conclusion that Leda was in the other moiety!—if they had such things here, which they didn't. And Uncle Jack—well, he wasn't "uncle"—but how would you say it in English?

"John had been a business secretary and factotum to your other grandfather and he was the perfect choice, of course; he knew the inner workings better than anyone, except your grandfather himself. After we got over the shock of our tragic loss

we realized that the world must go on and that John could handle it as well as if he had been Rudbek himself."

"He's been simply wonderful!" grandmother chirped.

"Yes, he has. I must admit that your grandmother and I became used to a comfortable scale of living after Creighton married. College salaries are never what they should be; Creighton and Martha were very generous. Your grandmother and I might have found it difficult after we realized that our son was gone, never to come back, had not John told us not to worry. He saw to it that our benefit continued just as before."

"And increased it," Grandmother Bradley added emphatically.

"Well, yes. All the family—we think of ourselves as part of Rudbek family even though we bear a proud name of our own—all of the family have been pleased with John's stewardship."

Thorby was interested in something other than "Uncle Jack's" virtues. "You told me that we left Akka, jumping for Far-Star, and never made it? That's a long, long way from Jubbul."

"I suppose it is. The College has only a small Galactovue and I must admit that it is hard to realize that what appears to be an inch or so is actually many light-years."

"About a hundred and seventy light-years, in this case."

"Let me see, how much would that be in miles?"

"You don't measure it that way, any more than you measure that couchomat you're on in microns."

"Come now, young man, don't be pedantic."

"I wasn't being, Grandfather. I was thinking that it was a long way from where I was captured to where I was last sold. I hadn't known it."

"I heard you use that term 'sold' once before. You must realize that it is not correct. After all, the serfdom practiced in the Sargony is not chattel slavery. It derives from the ancient Hindu guild or 'caste' system—a stabilized social order with mutual obligations, up and down. You must not call it 'slavery.'"

"I don't know any other word to translate the Sargonese term."

"I could think of several, though I don't know Sargonese . . . it's not a useful tongue in scholarship. But, my dear Thor, you aren't a student of human histories and culture. Grant me a little authority in my own field."

"Well . . ." Thorby felt baffled. "I don't know System English perfectly and there's a lot of history I don't know—there's an awful lot of history."

"So there is. As I am the first to admit."

"But I can't translate any better—I was sold and I was a slave!"

"Now, Son."

"Don't contradict your grandfather, dear, that's a good boy."

Thorby shut up. He had already mentioned his years as a beggar—and had discovered that his grand-

mother was horrified, had felt that he had disgraced himself, though she did not quite say so. And he had already found that while his grandfather knew much about many things, he was just as certain of his knowledge when Thorby's eyes had reported things differently. Thorby concluded glumly that it was part of being senior and nothing could be done about it. He listened while Grandfather Bradley discoursed on the history of the Nine Worlds. It didn't agree with what the Sargonese believed but wasn't too far from what Pop had taught him—other than about slavery. He was glad when the talk drifted back to the Rudbek organization. He admitted his difficulties.

"You can't build Rome in a day, Thor."

"It looks as if I never would learn! I've been thinking about going back into the Guard."

His grandfather frowned. "That would not be wise."

"Why not, sir?"

"If you don't have talent for business, there are other honorable professions."

"Meaning the Guard isn't?"

"Mm-m-m . . . your grandmother and I are philosophical pacifists. It cannot be denied that there is never a moral justification for taking human life."

"Never," agreed grandmother firmly.

Thorby wondered what Pop would think? Shucks, he knew!—Pop cut 'em down like grass to rescue a load

of slaves. "What do you do when a raider jumps you?"

"A what?"

"A pirate. You've got a pirate on your tail and closing fast."

"Why, you run, I suppose. It's not moral to stay and do battle. Thor, nothing is ever gained by violence."

"But you *can't* run; he has more legs. It's you or him."

"You mean 'he.' Then you surrender; that defeats his purpose . . . as the immortal Gandhi proved."

Thorby took a deep breath. "Grandfather, I'm sorry but it *doesn't* defeat his purpose. You have to fight. Raiders take slaves. The proudest thing I ever did was to burn one."

"Eh? 'Burn one?'"

"Hit him with a target-seeker. Blast him out of the sky."

Grandmother gasped. At last his grandfather said stiffly, "Thor, I'm afraid you've been exposed to bad influences. Not your fault, perhaps. But you have many misconceptions, both in fact and in evaluation. Now be logical. If you 'burned him' as you say, how do you *know* he intended—again, as you say—to 'take slaves'? What could he do with them? Nothing."

Thorby kept silent. It made a difference which side of the Plaza you saw a thing from . . . and if you didn't have status, you weren't listened to. That was a universal rule.

Grandfather Bradley continued, "So we'll say no more about it. On this other matter I'll give you the advice I would give your departed father: if you feel that you have no

head for trade, you don't have to enter it. But to run away and join the Guard, like some childish romantic—no, Son! But you needn't make up your mind for years. John is a very able regent; you don't have a decision facing you." He stood up. "I know, for I've discussed this with John, and he's willing, in all humility, to carry the burden a little farther . . . or much farther, if need be. And now we had all better seek our pillows. Morning comes early."

Thor left the next morning, with polite assurances that the house was his—which made him suspect that it was. He went to Rudbek City, having reached a decision during a restless night. He wanted to sleep with a live ship around him. He wanted to be back in Pop's outfit; being a billionaire boss wasn't his style.

He had to do something first; dig out those papers that father and mother had signed, compare them with the ones prepared for him—since father must have known what was needed—sign them, so that Uncle Jack could get on with the work after he was gone. Grandfather was right about that; John Weemsby knew how to do the job and he didn't. He should be grateful to Uncle Jack. He would thank him before he left. Then off Terra and out to where people talked his language!

He buzzed Uncle Jack's office as soon as he reached his own, was told that he was out of town. He decided that he could write a note and make

it sound better—oh yes! must say good-by to Leda. So he buzzed the legal department and told them to dig his parents' authorizations out of the vault and send them to his office.

Instead of papers, Judge Bruder arrived. "Rudbek, what's this about your ordering certain papers from the vault?"

Thorby explained. "I want to see them."

"No one but officers of the company can order papers from the vault."

"What am I?"

"I'm afraid you are a young man with confused notions. In time, you will have authority. But at the moment you are a visitor, learning something about your parents' affairs."

Thorby swallowed it; it was true, no matter how it tasted. "I've been meaning to ask you about that. What's the progress in the court action to have my parents declared dead?"

"Are you trying to bury them?"

"Of course not. But it has to be done, or so Uncle Jack says. So where are we?"

Bruder sniffed. "Nowhere, through your doing."

"What do you mean?"

"Young man, do you think that the officers of this company will initiate a process which would throw affairs of the firm into incredible confusion unless you take necessary steps to guard against it? Why, it may take *years* to settle the wills—

during which, business would come to a stop . . . simply because you neglected to sign a few simple instruments which I prepared weeks ago."

"You mean nothing will be done until I sign?"

"That is correct."

"I don't understand. Suppose I were dead—or had never been born. Does business stop every time a Rudbek dies?"

"Mm-m-m . . . well, no. A court authorizes matters to proceed. But you *are* here and we must take that into consideration. Now see here, I'm at the end of my patience. You seem to think, simply because you've read a few balance sheets, that you understand business. You don't. For example your belief that you can order instruments turned over to you that were given to John Weemsby personally and are not even company property. If you were to attempt to take charge of the firm at this time—if we proceeded with your notion to have your parents declared dead—I can see that we would have all sorts of confusion while you were finding your balance. We can't afford it. The company can't afford it. Rudbek can't afford it. So I want those papers signed today and no more shilly-shallying. You understand?"

Thorby lowered his head. "I won't."

"What do you mean, 'You won't'?"

"I won't sign anything until I know what I'm doing. If I can't

even see the papers my parents signed, then I certainly won't."

"We'll see about that!"

"I'm going to sit tight until I find out what's going on around here!"

XIX

Thorby discovered that finding out was difficult. Things went on much as before but were not the same. He had vaguely suspected that the help he was being given in learning the business had sometimes been too much not well enough organized; he felt smothered in unrelated figures, verbose and obscure "summaries," "analyses" that did not analyze. But he had known so little that it took time to become even a suspicion.

The suspicion became certainty from the day he defied Judge Bruder. Dolores seemed eager as ever and people still hopped when he spoke but the lavish flow of information trickled toward a stop. He was stalled with convincing excuses but could never quite find out what he wanted to know. A "survey is being prepared" or the man who "has charge of that is out of the city" or "those are vault files and none of the delegated officers are in today." Neither Judge Bruder nor Uncle Jack was ever available and their assistants were politely unhelpful. Nor was he able to corner Uncle Jack at the estate. Leda told him that "Daddy often has to go away on trips."

Things began to be confused in his own office. Despite the library

Dolores had set up she could not seem to find, or even recall, papers that he had marked for retention. Finally he lost his temper and bawled her out.

She took it quietly. "I'm sorry, sir. I'm trying very hard."

Thorby apologized. He knew a slow-down when he saw one; he had checked enough stevedores to know. But this poor creature could not help herself; he was lashing out at the wrong person. He added placatingly, "I really am sorry. Take the day off."

"Oh, I couldn't, sir."

"Who says so? Go home."

"I'd rather not, sir."

"Well . . . suit yourself. But go lie down in the ladies' lounge or something. That's an order. I'll see you tomorrow."

She looked worried and left. Thorby sat at his chaste, bare, unpowered executive desk and thought.

It was what he needed: to be alone without a flood of facts and figures. He started digesting what he had soaked up. Presently he started listing the results.

Item: Judge Bruder and Uncle Jack had put him in Coventry for refusing to sign the proxies.

Item: He might be 'Rudbek of Rudbek'—but Uncle Jack would continue to run things until Thorby's parents were legally dead.

Item: Judge Bruder had told him bluntly that no steps would be taken about the above until he admitted his incompetence and signed proxies.

Item: He did not know what his parents had signed. He had tried to

force a showdown—and had failed.

Item: "Ownership" and "control" were very different. Uncle Jack controlled everything that Thorby owned; Uncle Jack owned merely a nominal one share to qualify him as acting chairman of the board. (Leda owned a chunk as she was a Rudbek while Uncle Jack wasn't—but Uncle Jack probably controlled her stock, too; Leda paid no attention to business.)

Conclusions:

What conclusions? Was Uncle Jack doing something crooked and didn't dare let him find out? Well, it didn't look like it. Uncle Jack had salary and bonuses so large that only a miser would want more money simply as money. His parents' accounts seemed in order—they showed a huge balance; the megabuck Uncle Jack had handed him hardly made a dent. The only other withdrawals were for Grandfather and Grandmother Bradley, plus a few sums around the family or charged to the estates—nothing important, another couple of megabucks.

Conclusion: Uncle Jack was boss, like being boss, and meant to go on being boss if possible.

"Status" . . . Uncle Jack had high status and was fighting to keep it. Thorby felt that he understood him at last. Uncle Jack put up with the overwork he complained about because he *liked* being boss—just as captains and chief officers worked themselves silly, even though every member of a Free Trader family owned the same share. Uncle Jack was "chief officer" and didn't intend

to surrender his supreme status to someone a third his age who—let's face it—wasn't competent for the work the status required.

In this moment of insight Thorby felt that he ought to sign those proxies for Uncle Jack, who had earned the job whereas Thorby had merely inherited it. Uncle Jack must have been terribly disappointed when he had turned up alive; it must have seemed an utterly unfair twist of fate.

Well, let him have it! Settle things and join the Guard.

But Thorby was not ready to back down to Judge Bruder. He had been pushed around—and his strongest reflex was resistance to any authority he had not consented to; it had been burned into his soul with whips. He did not know this—he just knew that he was going to be stubborn. He decided that Pop would want him to be.

Thought of Pop reminded him of something. Was Rudbek connected, even indirectly, with the slave trade? He realized now why Pop wanted him to hang on—he could not quit until he knew . . . nor until he had put a stop to it if the unspeakable condition did exist. But how could he find out? He was Rudbek of Rudbek . . . but they had him tied with a thousand threads, like the fellow in that story Pop had told . . . "Gulliver and his Starship," that was it.

Well, let's see, Pop had reported to "X" Corps that there was a tie-up among some big spaceship outfit, the

Sargon's government, and the raider-slave traders. Raiders had to have ships. Ships . . . there was a book he had read last week, Galactic Transport's history of every ship they had built, from # 0001 to the latest. He went into his library. Hm-m-m . . . tall red book, not a tape.

Confounded thing was missing . . . like a lot of things lately. But he had almost renshawed the book, being interested in ships. He started making notes.

Most of them were in service inside the Hegemony, some in Rudbek interests, some in others. Some of his ships had been sold to the People, a pleasing thought. But some had wound up registered to owners he could not place . . . and yet he thought he knew the names, at least, of all outfits engaged in legitimate interstellar trade under the Hegemony—and he certainly would recognize any Free Trader clan.

No way to be sure of anything from his desk, even if he had the book. Maybe there was *no* way, from Terra . . . maybe even Judge Bruder and Uncle Jack would not know if something fishy were going on.

He got up and switched on the Galactovue he had had installed. It showed only the explored fraction of the Galaxy—even so, the scale was fantastically small. He began operating controls. First he lighted in green the Nine Worlds. Then he added, in yellow, pestholes avoided by the People. He lighted up the two planets between which he and

his parents had been captured, then did the same for every missing ship of the People concerning which he happened to know the span of the uncompleted jump.

The result was a constellation of colored lights, fairly close together as star distances go and in the same sector as the Nine Worlds. Thorby looked at it and whistled. Pop had known what he was talking about—yet it would be hard to spot unless displayed like this.

He began thinking about cruising ranges and fueling stations maintained by Galactic Transport out that way . . . then added in orange the banking offices of Galactic Acceptance Corporation in the "neighborhood."

Then he studied it.

It was not certain proof—yet what other outfit maintained such activities facing that sector?

He intended to find out.

XX

Thorby found that Leda had ordered dinner in the garden. They were alone, and falling snow turned the artificial sky into an opalescent bowl. Candles, flowers, a string trio, and Leda herself made the scene delightful but Thorby failed to enjoy it, even though he liked Leda and considered the garden the best part of Rudbek hall. The meal was almost over when Leda said, "A dollar for your thoughts."

Thorby looked guilty. "Uh, nothing."

"It must be a worrisome nothing."

"Well . . . yes."

"Want to tell Leda?"

Thorby blinked. Weemsby's daughter was the last one he could talk to. His gloom was caused by wonder as to what he could do if he became convinced that Rudbek was mixed up in slavery. "I guess I'm not cut out to be a businessman."

"Why, Daddy says you have a surprising head for figures."

Thorby snorted. "Then why doesn't he—" He stopped.

"Why doesn't he what?"

"Uh—" Doggone it, a man had to talk to somebody . . . someone who sympathized—or bawled him out if necessary. Like Pop. Like Fritz. Yeah, like Colonel Brisby. He was surrounded by people, yet utterly alone—except that Leda seemed to want to be friendly. "Leda, how much of what I say to you do you tell your father?"

To his amazement she blushed. "What made you say that, Thor?"

"Well, you are pretty close to him. Aren't you?"

She stood up suddenly. "If you've finished, let's walk."

Thorby stood up. They strolled paths, watched the storm, listened to its soft noises against the dome. She guided them to a spot away from the house and shielded by bushes and there sat down on a boulder. "This is a good spot—for private conversation."

"It is?"

"When the garden was wired, I made sure that there was somewhere

I could be kissed without Daddy's snoopers listening in."

Thorby stared. "You mean that?"

"Surely you realize you are monitored almost everywhere but the ski slopes?"

"I didn't. And I don't like it."

"Who does? But it is a routine precaution with anything as big as Rudbek; you mustn't blame Daddy. I just spent some credits to make sure the garden wasn't as well wired as he thought. So if you have anything to say you don't want Daddy to hear, you can talk now. He'll never know. That's a cross-my-heart promise."

Thorby hesitated, then checked the area. He decided that if a microphone were hidden nearby it must be disguised as a flower . . . which was possible. "Maybe I ought to save it for the ski slope."

"Relax, dear. If you trust me at all, trust me that this place is safe."

"Uh, all right." He found himself blurting out his frustrations . . . his conclusion that Uncle Jack was intentionally thwarting him unless he would turn over his potential power. Leda listened gravely. "That's it. Now—am I crazy?"

She said, "Thor, you know that Daddy has been throwing me at you?"

"Huh?"

"I don't see how you could miss it. Unless you are utterly—but then, perhaps you are. Just take it as true. It's one of those obvious marriages that everyone is enthusiastic about . . . except maybe the two most concerned."



Thorby forgot his worries in the face of this amazing statement. "You mean . . . well, uh, that you—" He trailed off.

"Heavens, dear! If I intended to go through with it, would I have told you anything? Oh, I admit I promised, before you arrived, to consider it. But you never warmed to the idea—and I'm too proud to be willing under those circumstances even if the preservation of Rudbek depended on it. Now what's this about Daddy not letting you see the proxies that Martha and Creighton gave him?"

"They won't let me see them; I won't sign until they do."

"But you'll sign if they do?"

"Uh . . . maybe I will, eventually. But I want to see what arrangements my parents made."

"I can't see why Daddy opposes such a reasonable request. Unless—" She frowned.

"Unless what?"

"What about your shares? Have those been turned over to you?"

"What shares?"

"Why, *yours*. You know what shares I hold. They were given to me when I was born, by Rudbek—your grandfather, I mean. My uncle. You probably got twice as many, since you were expected to become the Rudbek some day."

"I haven't any shares."

She nodded grimly. "That's one reason Daddy and the Judge don't want you to see those papers. Our personal shares don't depend on

anyone; they're ours to do as we please with, since we are both legal age. Your parents voted yours, just as Daddy still votes mine—but any proxy they assigned concerning your shares can't be any good now. You can pound the desk and they'll have to cough up, or shoot you." She frowned. "Not that they would shoot. Thor, Daddy is a good sort, most ways."

"I never said he wasn't."

"I don't love him, but I'm fond of him. But when it comes down to it, I'm a Rudbek and he's not. That's silly, isn't it? Because we Rudbeks aren't anything special; we're just shrewd peasants. But I've got a worry, too. You remember Joel de la Croix?"

"He's the one that wanted an interview with me?"

"That's right. Joey doesn't work here any more."

"I don't understand."

"He was a rising star in the engineering department of Galactic . . . didn't you know? The office says he left to accept other employment; Joey says he was fired for going over their heads to speak to you." She frowned. "I didn't know what to believe. Now I believe Joey. Well, Thor, are you going to take it lying down? Or prove that you are Rudbek of Rudbek?"

Thorby chewed his lip. "I'd like to go back into the Guard and forget the whole mess. I used to wonder what it was like to be rich. Now I *am* and it turns out to be mostly headaches."

"So you'd walk out on it?" Her voice was faintly scornful.

"I didn't say *that*. I'm going to stay and find out what goes on. Only I don't know how to start. You think I should pound Uncle Jack's desk and demand my shares?"

"Not without a lawyer at your side."

"There are too many lawyers in this now!"

"That's why you need one. It will take a sharp one to win a scrap with Judge Bruder."

"How do I find one?"

"Goodness, I don't use lawyers. But I can find out. Now let's stroll and chat—in case anybody is interested."

Thorby spent a glum morning studying corporation law. Just past lunch Leda called. "Thor, how about taking me skiing? The storm is over and the snow is just right." She looked at him eagerly.

"Well—"

"Oh, come on!"

He went. They said nothing until they were far from the house. Then Leda said, "The man you need is James J. Garsch, New Washington."

"I thought that must be why you called. Do you want to ski? I'd like to go back and call him."

"Oh, my!" She shook her head sadly. "Thor, I may have to marry you just to mother you. You go back to the house and call a lawyer outside Rudbek—one whose reputation is sky high. What happens?"

"What?"

"You might wake up in a quiet place with big muscular nurses around you. I've had a sleepless night and I'm convinced they mean business. So I had to make up my mind. I was willing for Daddy to run things forever—but if he fights dirty, I'm on your side."

"Thanks, Leda."

"Thanks" he says! Thor, this is for Rudbek. Now to business. You can't grab your hat and go to New Washington to retain a lawyer. If I know Judge Bruder, he has planned what to do if you try. But you can go look at some of your estate—starting with your house in New Washington."

"That's smart, Leda."

"I'm so smart I dazzle myself. If you want it to look good, you'll invite me along—Daddy has told me that I ought to show you around."

"Why, sure, Leda. If it won't be too much trouble."

"I'll simply force myself. We'll actually do some sightseeing, in the Department of North America, at least. The only thing that bothers me is how to get away from the guards."

"Guards?"

"Nobody high up in Rudbek ever travels without bodyguards. Why, you'd be run ragged by reporters and crackpots."

"I think," Thorby said slowly, "that you must be mistaken in my case. I went to see my grandparents. There weren't any guards."

"They specialize in being unobtrusive. I'll bet there were always

at least two in your grandmother's house while you were there. See that solitary skier? Long odds he's not skiing for fun. So we have to find a way to get them off your neck while you look up Counselor Garsch. Don't worry, I'll think of something."

Thorby was immensely interested in the great capital but still more interested in getting on with his purpose. Leda did not let him hurry. "First we sight-see. We naturally would."

The house, simple compared with Rudbek—twenty rooms, only two of them large—was as ready as if he had stepped out the day before. Two of the servants he recognized as having been at Rudbek. A ground-car, with driver and footman in Rudbek livery, was waiting. The driver seemed to know where to take them; they rode around in the semitropic winter sunshine and Leda pointed out planetary embassies and consulates. When they passed the immense pile which is headquarters of the Hegemonic Guard, Thorby had the driver slow down while he rubber-necked. Leda said, "That's your alma mater, isn't it?" Then she whispered, "Take a good look. The building opposite its main door is where you are going."

They got out at the Replica Lincoln Memorial, walked up the steps and felt the same hushed awe that millions have felt when looking at that brooding giant figure. Thorby had a sudden feeling that the statue

looked like Pop—not that it did—but still it *did*. His eyes filled with tears.

Leda whispered, "This place always gets me—it's like a haunted church. You know who he was? He founded America. Ancient history is awesome."

"He did something else."

"What?"

"He freed slaves."

"Oh." She looked up with sober eyes. "That means something special to you . . . doesn't it?"

"Very special." He considered telling Leda his strongest reason for pushing the fight, since they were alone and this was a place that wouldn't be bugged. But he couldn't. He felt that Pop would not mind—but he had promised Colonel Brisby.

He puzzled over inscriptions on the walls, in letters and spelling used before English became System English. Leda tugged his sleeve and whispered, "Come on. I can never stay here long or I start crying." They tiptoed away.

Leda decided that she just had to see the show at the Milky Way. So they got out and she told the driver to pick them up in three hours and ten minutes, then Thorby paid outrageous scalpers' prices for a double booth and immediate occupancy.

"There!" she sighed as they started inside. "That's half of it. The footman will drop off as they round the corner, but we're rid of the driver for a while; there isn't a place to park around here. But the footman

will be right behind us, if he wants to keep his job. He's buying a ticket this minute. Or maybe he's already inside. Don't look."

They started up the escalator. "This gives us a few seconds; he won't get on until we curve out of sight. Now listen. The people holding these seats will leave as soon as we show the tickets—only I'm going to hang onto one, pay him to stay. Let's hope it's a man because our nursemaid is going to spot that booth in minutes . . . seconds, if he was able to get our booth number down below. You keep going. When he finds our booth he'll see me in it with a man. He won't see the man's face in the dark but he'll be certain of me because of this outlandish, night-glow outfit I'm wearing. So he'll be happy. You zip out any exit but the main lobby; the driver will probably wait there. Try to be in the outer lobby a few minutes before the time I told them to have the car. If you don't make it, hire a flea-cab and go home. I'll complain aloud that you didn't like the show and went home."

Thorby decided that the "X" Corps had missed a bet in Leda. "Won't they report that they lost track of me?"

"They'll be so relieved they'll never breathe it. Here we are—keep moving. See you!"

Thorby went out a side exit, got lost, got straightened out by a cop, at last found the building across from Guard SHQ. The building directory

showed that Garsch had offices on the thirty-fourth terrace; a few minutes later he faced a receptionist whose mouth was permanently pursed in "No."

She informed him frostily that the counselor never saw anyone except by appointment. Did he care to make an inquiry appointment with one of the counselor's associates? "Name, please!"

Thorby glanced around, the room was crowded. She slapped a switch. "Speak up!" she snapped. "I've turned on the privacy curtain."

"Please tell Mr. Garsch that Rudbek of Rudbek would like to see him."

Thorby thought that she was about to tell him not to tell fibs. Then she got up hastily and left.

She came back and said quietly, "The counselor can give you five minutes. This way, sir."

James J. Garsch's private office was in sharp contrast with building and suite; he himself looked like an unmade bed. He wore trousers, not tights, and his belly bulged over his belt. He had not shaved that day; his grizzled beard matched the fringe around his scalp. He did not stand up. "Rudbek?"

"Yes, sir. Mr. James J. Garsch?"

"The same. Identification? Seems to me I saw your face in the news but I don't recollect."

Thorby handed over his ID folder. Garsch glanced at the public ID, studied the rare and more difficult-to-counterfeit ID of Rudbek & Associates.

He handed it back. "Siddown. What can I do for you?"

"I need advice . . . and help."

"That's what I sell. But Bruder has lawyers running out of his ears. What can I do for you?"

"Uh, is this confidential?"

"Privileged, son. The word is 'privileged.' You don't ask a lawyer that; he's either honest or he ain't. Me, I'm middlin' honest. You take your chances."

"Well . . . it's a long story."

"Then make it short. You talk. I listen."

"You'll represent me?"

"You talk, I listen," Garsch repeated. "Maybe I'll go to sleep. I ain't feeling my best today. I never do."

"All right." Thorby launched into it. Garsch listened with eyes closed, fingers laced over his bulge.

"That's all," concluded Thorby, "except that I'm anxious to get straightened out so that I can go back into the Guard."

Garsch for the first time showed interest. "Rudbek of Rudbek? In the Guard? Let's not be silly, son."

"But I'm not really 'Rudbek of Rudbek.' I'm an enlisted Guardsman who got pitched into it by circumstances beyond my control."

"I knew that part of your story; the throb writers ate it up. But we all got circumstances we can't control. Point is, a man doesn't quit his job. Not when it's *his*."

"It's not mine," Thorby answered stubbornly.

"Let's not fiddle. First, we get

your parents declared dead. Second, we demand their wills and proxies. If they make a fuss, we get a court order . . . and even the mighty Rudbek folds up under a simple subpoena-or-be-locked-up-for-contempt." He bit a fingernail. "Might be some time before the estate is settled and you are qualified. Court might appoint you to act, or the wills may say who, or the court might appoint somebody else. But it won't be those two, if what you say is correct. Even one of Bruder's pocket judges wouldn't dare; it would be too raw and he'd know he'd be reversed."

"But what can I do if they won't even start the action to have my parents declared dead?"

"Who told you you had to wait on them? You're the interested party; they might not even qualify as *amicus curiae*. If I recall the gossip, they're hired hands, qualified with one nominal share each. You're the number-one interested party, so you start the action. Other relatives? First cousins, maybe?"

"No first cousins. I don't know what other heirs there may be. There's my grandparents Bradley."

"Didn't know they were alive. Will they fight you?"

Thorby started to say no, changed his mind. "I don't know."

"Cross it when we come to it. Other heirs . . . well, we won't know till we get a squint at the wills—and that probably won't happen until a court forces them. Any objection

to hypnotic evidence? Truth drugs? Lie detectors?"

"No. Why?"

"You're the best witness that they are dead, not just long time missing."

"But if a person is missing long enough?"

"Depends. Any term of years is just a guide to the court, not a rule of law. Time was when seven years would do it—but that's no longer true. Things are roomier now."

"How do we start?"

"Got any money? Or have they got you hogtied on that? I come high. I usually charge for each exhale and inhale."

"Well, I've got a megabuck . . . and a few thousand more. About eight."

"Hm-m-m . . . Haven't said I'd take this case. Has it occurred to you that your life may be in danger?"

"Huh! No, it hasn't."

"Son, people do odd things for money, but they'll do still more drastic things for power over money. Anybody sittin' close to a billion credits is in danger; it's like keeping a pet rattlesnake. If I were you and started feeling ill, I'd pick my own doctor. I'd be cautious about going through doors and standing close to open windows." He thought, "Rudbek is not a good place for you now; don't tempt them. Matter of fact, you ought not to be here. Belong to the Diplomatic Club?"

"No, sir."

"You do now. People 'ud be surprised if you didn't. I'm often there,

around six. Got a room there, sort of private. Twenty eleven."

"'Twenty eleven.'"

"I still haven't said I'd take it. Got any idea what I'd have to do if I lose this case?"

"Eh? No, sir."

"What was that place you mentioned? Jubbulpore? That's where I'd have to move." Suddenly he grinned. "But I've been spoiling for a fight. Rudbek, eh? Bruder. You mentioned a megabuck?"

Thorby got out his book of checking certificates, passed them over. Garsch riffled through it, shoved it into a drawer. "We won't convert this now; they're almost certainly noting your withdrawals. Anyhow, it's going to cost you more. G'bye. Say in a couple of days."

Thorby left, feeling bucked up. He had never met a more mercenary, predatory old man—he reminded Thorby of the old, scarred freedmen professionals who swaggered around the New Amphitheater.

As he came outdoors he saw Guard Headquarters. He looked again—then ducked through murderous traffic and ran up its steps.

XXI

Thorby found a circle of receptionist booths around the great foyer. He pushed through crowds pouring out and went into one. A contralto voice said, "Punch your name. State department and office into the microphone. Wait until the light appears, then state your business. You are

reminded that working hours are over and only emergencies are now handled."

Thorby punched, "Thorby Baslim," into the machine, then said, "Exotic Corps."

He waited. The tape repeated, "Punch your name. State the department and office into—" It suddenly cut off. A man's voice said, "Repeat that."

"Exotic Corps."

"Business?"

"Better check my name in your files."

At last another female voice chanted, "Follow the light immediately over your head. Do not lose it."

He followed it up escalators, down slideways, and into an unmarked door, where a man not in uniform led him through two more. He faced another man in civilian clothes who stood up and said, "Rudbek of Rudbek. I am Wing Marshal Smith."

"Thorby Baslim, please, sir. Not 'Rudbek.'"

"Names aren't important but identities are. Mine isn't 'Smith,' but it will do. I suppose you have identification?"

Thorby produced his ID again. "You probably have my fingerprints."

"They'll be here in a moment. Do you mind supplying them again?"

While Thorby had his prints taken, a print file card popped out onto the Marshal's desk. He put both sets into a comparator, seemed to pay no attention but until it flashed green he spoke only politenesses.

Then he said, "All right, Thorby Baslim . . . Rudbek. What can I do for you?"

"Maybe it's what I can do for you?"

"So?"

"I came here for two reasons," Thorby stated. "The first is, I think I can add something to Colonel Baslim's final report. You know who I mean?"

"I knew him and admired him very much. Go on."

"The second is—I'd like to go back into the Guard and go 'X' Corps." Thorby couldn't recall when he had decided this, but he had—not just Pop's outfit, Pop's own corps. Pop's work.

"Smith" raised his brows. "So? Rudbek of Rudbek?"

"I'm getting that fixed." Thorby sketched rapidly how he must settle his parents' estate, arrange for handling of their affairs. "Then I'm free. I know it's presumptuous of an acting ordnanceman third class—no, I was busted from that; I had a fight—for a boot Guardsman to talk about 'X' Corps, but I think I've got things you could use. I know the People . . . the Free Traders, I mean. I speak several languages. I know how to behave in the Nine Worlds. I've been around a bit, not much and I'm no astrogator . . . but I've traveled a little. But besides that, I've seen how Pop — Colonel Baslim — worked. Maybe I could do some of it."

"You have to love this work to do it. Lots of times it's nasty . . .

things a man wouldn't do, for his own self-respect, if he didn't think it was necessary."

"But I do! Uh, I was a slave. You knew that? Maybe it would help if a man knew how a slave feels."

"Perhaps. Though it might make you too emotional. Besides, slave traffic isn't all we are interested in. A man comes here, we don't promise him certain work. He does what he's told. We use him. We usually use him up. Our casualty rate is high."

"I'll do what I'm told. I just happen to be interested in the slave traffic. Why, most people here don't seem to know it exists."

"Most of what we deal in the public wouldn't believe. Can you expect the people you see around you to take seriously unbelievable stories about faraway places? You must remember that less than one per cent of the race ever leaves its various planets of birth."

"Uh, I suppose so. Anyhow they don't believe it."

"That's not our worst handicap. The Terran Hegemony is no empire; it is simply leadership in a loose confederation of planets. The difference between what the Guard *could* do and what it is *allowed* to do is very frustrating. If you have come here thinking that you will see slavery abolished in your lifetime, disabuse your mind. Our most optimistic target date is two centuries away—and by that time slavery will have broken out in planets not even discovered today. Not a problem to

be solved once and for all. A continuing process."

"All I want to know is, can I help?"

"I don't know. Not because you describe yourself as a junior enlisted man . . . we're all pretty much the same rank in this place. The Exotic Corps is an idea, not an organization chart. I'm not worried about what Thorby Baslim can do; he can do something, even if it's only translating. But Rudbek of Rudbek . . . I wonder."

"But I told you I was getting rid of that!"

"Well—let's wait until you have. By your own statement you are not presenting yourself for enrollment today. What about the other reason? Something to add to Colonel Baslim's report?"

Thorby hesitated. "Sir, Colonel Brisby, my C.O., told me that P . . . Colonel Baslim had proved a connection between the slave trade and some big starship-building outfit."

"He told you that?"

"Yes, sir. You could look it up in Colonel Baslim's report."

"I don't need to. Go on."

"Well . . . is it Rudbek he was talking about? Galactic Transport, that is?"

"Smith" considered it. "Why ask me if your company is mixed up in slave trade? You tell us."

Thorby frowned. "Is there a Galactovue around here?"

"Down the hall."

"May I use it?"

"Why not?"

The Wing Marshal led him through a private corridor into a conference room dominated by a star-flecked stereo display. It was much the biggest Thorby had ever seen.

He had to ask questions; it had complicated controls. Then he got to work. His face puckering with strain, Thorby painted in colored lights amid fairy stars the solid picture he had built in the Galactovue in his office. He did not explain and the officer watched in silence. Thorby stepped back at last. "That's all I know now."

"You missed a few." The Wing Marshal added some lights in yellow, some in red, then working slowly, added half a dozen missing ships. "But that's quite a feat to do from memory and a remarkable concatenation of ideas. I see you included yourself—maybe it does help to have

a personal interest." He stepped back. "Well, Baslim, you asked a question. Are you ready to answer it?"

"I think Galactic Transport is in it up to here! Not everybody, but enough key people. Supplying ships. And repairs and fuel. Financing, maybe."

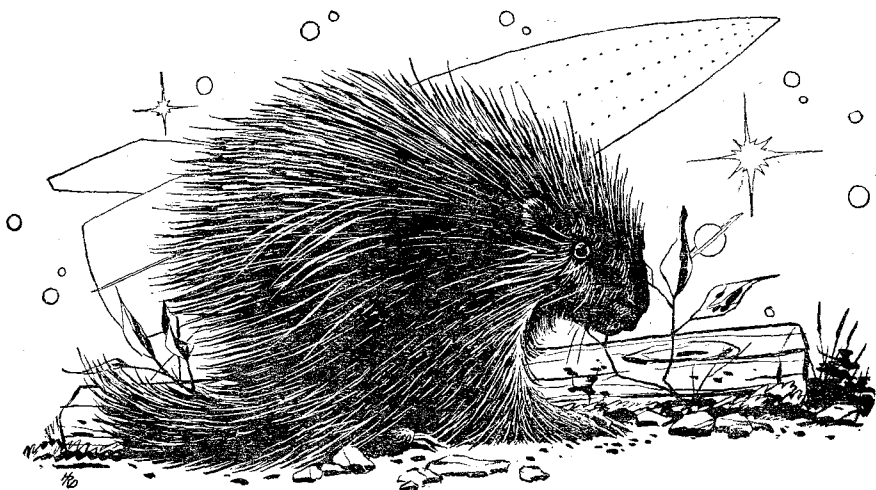
"Hm-m-m . . ."

"Is all this physically possible otherwise?"

"You know what they would say if you accused them of slave trading—"

"Not the trade itself. At least I don't think so."

"Connected with it. First they would say that they had never heard of any slave trade, or that it was just a wild rumor. Then they would say that, in any case, they just sell ships



—and is a hardware dealer who sells a knife responsible if a husband carves his wife?"

"The cases aren't parallel."

"They wouldn't concede that. They would say that they were not breaking any laws and even stipulating that there might be slavery somewhere, how can you expect people to get worked up over a possible evil light-years away? In which they are correct; you can't expect people to, because they *won't*. Then some well-dressed character will venture the opinion that slavery—when it existed—was not so bad, because a large part of the population is really happier if they don't have the responsibilities of a free man. Then he'll add that if they didn't sell ships, someone else would—it's just business."

Thorby thought of nameless little Thorbys out there in the dark, crying hopelessly with fear and loneliness and hurt, in the reeking holds of slavers—ships that might be *his*. "One stroke of the lash would change his slimy mind!"

"Surely. But we've abolished the lash here. Sometimes I wonder if we should have." He looked at the display. "I'm going to record this; it has facets not yet considered together. Thanks for coming in. If you get more ideas, come in again."

Thorby realized that his notion of joining the corps had not been taken seriously. "Marshal Smith . . . there's one other thing I might do."

"What?"

"Before I join, if you let me . . .

or maybe after; I don't know how you do such things . . . I could go out as Rudbek of Rudbek, in my own ship, and check those places—the red ones, ours. Maybe the boss can dig out things that a secret agent would have trouble getting close to."

"Maybe. But you know that your father started to make an inspection trip once. He wasn't lucky in it." Smith scratched his chin. "We've never quite accounted for that one. Until you showed up alive, we assumed that it was natural disaster. A yacht with three passengers, a crew of eight and no cargo doesn't look like worthwhile pickings for bandits in business for profit—and they generally know what they're doing."

Thorby was shocked. "Are you suggesting that—"

"I'm not suggesting anything. But bosses prying into employees' sidelines have, in other times and places, burned their fingers. And your father was certainly checking."

"About the slave trade?"

"I couldn't guess. Inspecting. In that area. I've got to excuse myself. But do come see me again . . . or phone and someone will come to you."

"Marshal Smith . . . what parts of this, if any, can be talked over with other people?"

"Eh? Any of it. As long as you don't attribute it to this corps, or to the Guard. But facts as you know them"—he shrugged—"who will believe you? Although if you talk to your business associates about your suspicions, you may arouse strong

feelings against you personally . . . some of those feelings sincere and honest. The others? I wish I knew."

Thorby was so late that Leda was both vexed and bursting with curiosity. But she had to contain it not only because of possible monitoring but because of an elderly aunt who had called to pay her respects to Rudbek of Rudbek, and was staying the night. It was not until next day, while examining Aztec relics in the Fifth of May Museum, that they were able to talk.

Thorby recounted what Garsch had said, then decided to tell more. "I looked into rejoining the Guard yesterday."

"Thor!"

"Oh, I'm not walking out. But I have a reason. The Guard is the only organization trying to put a stop to slave traffic. But that is all the more reason why I can't enlist now." He outlined his suspicions about Rudbek and the traffic.

Her face grew pale. "Thor, that's the most horrible idea I ever heard. I *can't* believe it."

"I'd like to prove it isn't true. But somebody builds their ships, somebody maintains them. Slavers are not engineers; they're parasites."

"I still have trouble believing that there is such a thing as slavery."

He shrugged. "Ten lashes will convince anybody."

"Thor! You don't mean they *whipped* you?"

"I don't remember clearly. But the scars are on my back."

She was very quiet on the way home.

Thorby saw Garsch once more, then they headed for the Yukon, in company with the elderly aunt, who had somehow attached herself. Garsch had papers for Thorby to sign and two pieces of information. "The first action has to be at Rudbek, because that was the legal residence of your parents. The other thing is, I did some digging in newspaper files."

"Yes?"

"Your grandfather did give you a healthy block of stock. It was in stories about the whoop-te-do when you were born. The *Bourse Journal* listed the shares by serial numbers. So we'll hit 'em with that, too—on the same day. Don't want one to tip off the other."

"You're the doctor."

"But I don't want you in Rudbek until the clerk shouts 'Oyez!' Here's a mail-drop you can use to reach me . . . even phone through, if you have to. And right smartly you set up a way for me to reach you."

Thorby puzzled over that requirement, being hemmed in as he was by bodyguards. "Why don't you, or somebody—a young man, maybe—phone my cousin with a code message? People are always phoning her and most of them are young men. She'll tell me and I'll find a place to phone back."

"Good idea. He'll ask if she knows how many shopping days are left till Christmas. All right—see you in

court." Garsch grinned. "This is going to be fun. And very, very expensive for you. G'bye."

XXII

"Have a nice vacation?" Uncle Jack smiled at him. "You've led us quite a chase. You shouldn't do that, boy."

Thorby wanted to hit him but, although the guards let go his arms when they shoved him into the room, his wrists were tied.

Uncle Jack stopped smiling and glanced at Judge Bruder. "Thor, you've never appreciated that Judge Bruder and I worked for your father, and for your grandfather. Naturally we know what's best. But you've given us trouble and now we'll just have to show you how we handle little boys who don't appreciate decent treatment. We teach them. Ready, Judge?"

Judge Bruder smiled savagely and took the whip from behind him. "Bend him over the desk!"

Thorby woke up gasping. *Whew*, a bad one! He looked around the small hotel room he was in and tried to remember where he was. For days he had moved daily, sometimes half around the planet. He had become sophisticated in the folkways of this planet, enough not to attract attention, and even had a new ID card, quite as good as a real one. It had not been difficult, once he realized that underworlds were much the same everywhere.

He remembered now—this was *América de Sud*.

The bed alarm sounded—just midnight, time to leave. He dressed and glanced at his baggage, decided to abandon it. He walked down the backstairs, out the back way.

Aunt Lizzie had not liked the Yukon cold but she put up with it. Eventually someone called and reminded Leda that there were few shopping days to Christmas, so they left. At Uranium City Thorby managed to return the call. Garsch grinned. "I'll see you in the district court in-and-for the county of Rudbek, division four, at nine-fifty-nine the morning of January fourth. Now get lost completely."

So at San Francisco Thorby and Leda had a tiff in the presence of Aunt Lizzie; Leda wanted to go to Nice, Thorby insisted on Australia. Thorby said angrily, "Keep the air car! I'll go by myself." He flounced out and bought a ticket for Great Sydney.

He pulled a rather old washroom trick, tubed under the Bay, and, convinced that his bodyguard had been evaded, counted the cash Leda had slipped him as privately as they had quarreled publicly. It came to a little under two hundred thousand credits. There was a note saying that she was sorry it wasn't more but she had not anticipated needing money.

While waiting at the South American field Thorby counted what was left of Leda's money and reflected

that he had cut it fine, both time and money. Where did it all go?

Photographers and reporters gave him a bad time at Rudbek city; the place swarmed with them. But he pushed through and met Garsch inside the bar at nine-fifty-eight. The old man nodded. "Siddown. Hiz-zoner will be out soon."

The judge came out and a clerk intoned the ancient promise of justice: "... Draw nigh and ye shall be heard!" Garsch remarked, "Bruder has this judge on a leash."

"Huh? Then why are we here?"

"You're paying me to worry. Any judge is a good judge when he knows he's being watched. Look behind you."

Thorby did so. The place was so loaded with press that a common citizen stood no chance. "I did a good job, if I do say so." Garsch hooked a thumb at the front row. "The galoot with the big nose is the ambassador from Proxima. The old thief next to him is chairman of the judiciary committee. And—" He broke off.

Thorby could not spot Uncle Jack but Bruder presided over the other table—he did not look at Thorby. Nor could Thorby find Leda. It made him feel very much alone. But Garsch finished opening formalities, sat down and whispered. "Message for you. Young lady says to say 'Good luck.'"

Thorby was active only in giving testimony and that after many objections, counter-objections, and warn-

ings from the bench. While he was being sworn, he recognized in the front row a retired chief justice of the Hegemonic Ultimate Court who had once dined at Rudbek. Then Thorby did not notice anything, for he gave his testimony in deep trance surrounded by hypnotherapists.

Although every point was chewed endlessly, only once did the hearing approach drama. The court sustained an objection by Bruder in such fashion that a titter of unbelief ran around the room and someone stamped his feet. The judge turned red. "Order! The bailiffs will clear the room!"

The move to comply started, over protests of reporters. But the front two rows sat tight and stared at the judge. The High Ambassador from the Vegan League leaned toward his secretary and whispered; the secretary started slapping a Silent-Steno.

The judge cleared his throat. "... Unless this unseemly behavior ceases at once! This court will not tolerate disrespect."

Thorby was almost surprised when it ended: "... Must therefore be conclusively presumed that Creighton Bradley Rudbek and Martha Bradley Rudbek did each die, are now dead, and furthermore did meet their ends in common disaster. May their souls rest in peace. Let it be so recorded." The court banged his gavel. "If custodians of wills of the decedents, if wills there be, are present in this court, let them now come forward."

There was no hearing about Thorby's own shares; Thorby signed a

receipt for certificates thereto in the judge's chambers. Neither Weemsby nor Bruder was present.

Thorby took a deep breath as Garsch and he came out of chambers. "I can hardly believe that we've won."

Garsch grinned. "Don't kid yourself. We won the first round on points. Now it begins to get expensive."

Thorby's mouth sagged. Rudbek guards moved in and started taking them through the crowd.

Garsch had not overstated it. Bruder and Weemsby sat tight, still running Rudbek & Associates, and continued to fight. Thorby never did see his parents' proxies—his only interest in them now was to see whether, as he suspected, the difference between the papers Bruder had prepared and those of his parents lay in the difference between "revocable" and "revocable only by mutual agreement."

But when the court got around to ordering them produced, Bruder claimed that they had been destroyed in routine clearing from files of expired instruments. He received a ten-day sentence for contempt, suspended, and that ended it.

But, while Weemsby was no longer voting the shares of Martha and Creighton Rudbek, neither was Thorby; the shares were tied up while the wills were being proved. In the meantime, Bruder and Weemsby remained officers of Rudbek & Associates, with a majority of directors

backing them. Thorby was not even allowed in Rudbek Building, much less in his old office.

Weemsby never went back to Rudbek estate; his belongings were sent to him. Thorby moved Garsch into Weemsby's apartment. The old man slept there often; they were very busy.

At one point Garsch told him that there were ninety-seven actions, for or against, moving or pending, relating to the settlement of his estate. The wills were simple in essence; Thorby was the only major heir. But there were dozens of minor bequests; there were relatives who might get something if the wills were set aside; the question of "legally dead" was again raised, the presumption of "common disaster" versus deaths at different times was hashed again; and Thorby's very identity was questioned. Neither Bruder nor Weemsby appeared in these actions; some relative or stockholder was always named as petitioner—Thorby was forced to conclude that Uncle Jack had kept everyone happy.

But the only action that grieved him was brought by his grandparents Bradley, asking that he be made their ward because of incompetence. The evidence, other than the admitted fact that he was new to the complexities of Terran life, was his Guardsman medical record—a Dr. Krishnamurti had endorsed that he was "potentially emotionally unstable and should not be held fully answerable for actions under stress."

Garsch had him examined in

blatant publicity by the physician to the Secretary General of the Hege-monic Assembly. Thorby was found legally sane. It was followed by a stockholder's suit asking that Thorby be found professionally unequipped to manage the affairs of Rudbek & Associates, in private and public interest.

Thorby was badly squeezed by these maneuvers; he was finding it ruinously expensive to be rich. He was heavily in debt from legal costs and running Rudbek estate and had not been able to draw his own accumulated royalties as Bruder and Weemsby continued to contend, despite repeated adverse decisions, that his identity was uncertain.

But a weary time later a court three levels above the Rudbek district court awarded to Thorby—subject to admonitions as to behavior and unless revoked by court—the power to vote his parents' stock until such time as their estates were settled.

Thorby called a general meeting of stockholders, on stockholders' initiative as permitted by the by-laws, to elect officers.

The meeting was in the auditorium of Rudbek Building; most stockholders on Terra showed up even if represented by proxy. Even Leda popped in at the last minute, called out merrily, "Hello, everybody!" then turned to her stepfather. "Daddy, I got the notice and decided to see the fun—so I jumped into the bus and hopped over. I haven't missed anything, have I?"

She barely glanced at Thorby, although he was on the platform with the officers. Thorby was relieved and hurt; he had not seen her since they had parted at San Francisco. He knew that she had residence at Rudbek Arms in Rudbek city and was sometimes in town, but Garsch had discouraged him from getting in touch with her—"Man's a fool to chase a woman when she's made it plain she doesn't want to see him."

So he simply reminded himself that he must pay back her loan—with interest—as soon as possible.

Weemsby called the meeting to order, announced that in accordance with the call the meeting would nominate and elect officers. "Minutes and old business postponed by unanimous consent." *Bang!* "Let the secretary call the roll for nominations for chairman of the board." His face wore a smile of triumph.

The smile worried Thorby. He controlled, his own and his parents', just under 45% of the voting stock. From the names used in bringing suits and other indirect sources he thought that Weemsby controlled about 31%; Thorby needed to pick up 6%. He was counting on the emotional appeal of "Rudbek of Rudbek"—but he couldn't be sure, even though Weemsby needed more than three times as many "uncertain" votes . . . uncertain to Thorby; they might be in Weemsby's pocket.

But Thorby stood up and nominated himself, through his own stock. "Thor Rudbek of Rudbek!"

After that it was pass, pass, pass,



over and over again—until Weemsby was nominated. There were no other nominations.

"The Secretary will call the roll," Weemsby intoned.

"Announce your votes by shares as owners, followed by votes as proxy. The clerk will check serial numbers against the Great Record. Thor Rudbek . . . of Rudbek."

Thorby voted all 45%-minus that he controlled, then sat down feeling very weary. But he got out a pocket calculator. There were 94,000 voting shares; he did not trust himself to keep tally in his head. The secretary read on, the clerk droned his checks of the record. Thorby needed to pick up 5657 votes, to win by one vote.

He began slowly to pick up odd votes—232, 906, 1917—some of them directly, some through proxy. But Weemsby picked up votes also. Some shareholders answered, "Pass to proxy," or failed to respond—as the names marched past and these missing votes did not appear, Thorby was forced to infer that Weemsby held those proxies himself. But still the additional votes for "Rudbek of Rudbek" mounted—2205, 3036, 4309 . . . and there it stuck. The last few names passed.

Garsch leaned toward him. "Just the sunshine twins left."

"I know." Thorby put away his calculator, feeling sick—so Weemsby had won, after all.

The secretary had evidently been instructed what names to read last. "The Honorable Curt Bruder!"

Bruder voted his one qualifying share for Weemsby. "Our Chairman, Mr. John Weemsby."

Weemsby stood up and looked happy. "In my own person, I vote one share. By proxies delivered to me and now with the secretary I vote—" Thorby did not listen; he was looking for his hat.

"The tally being complete, I declare—" the secretary began.

"No!"

Leda was on her feet. "I'm here myself. This is my first meeting and I'm going to vote!"

Her stepfather said hastily, "That's all right, Leda—mustn't interrupt." He turned to the secretary. "It doesn't affect the result."

"But it *does*! I cast one thousand

eight hundred and eighty votes for Thor, Rudbek of Rudbek!"

Weemsby stared. "Leda Weemsby!"

She retorted crisply, "My legal name is Leda Rudbek."

Bruder was shouting, "Illegal! The vote has been recorded. It's too—"

"Oh, nonsense!" shouted Leda. "I'm here and I'm voting. Anyway, I canceled that proxy—I registered it in the post office in this very building and saw it delivered and signed for at the 'principal offices of this corporation'—that's the right phrase, isn't it, Judge?—ten minutes before the meeting was called to order. If you don't believe me, send down for it. But what of it?—I'm here. Touch me." Then she turned and smiled at Thorby.

Thorby tried to smile back, and whispered savagely to Garsch, "Why did you keep this a secret?"

"And let 'Honest John' find out that he had to beg, borrow, or buy some more votes? He might have won. She kept him happy, just as I told her to. That's quite a girl, Thorby. Better option her."

Five minutes later Thorby, shaking and white, got up and took the gavel that Weemsby had dropped. He faced the crowd. "We will now elect the rest of the board," he announced, his voice barely under control. The slate that Garsch and Thorby had worked out was passed by acclamation—with one addition: Leda.

Again she stood up. "Oh, no! You can't do this to me."

"Out of order. You've assumed responsibility, now accept it."

She opened her mouth, closed it, sat down.

When the secretary declared the result, Thorby turned to Weemsby. "You are General Manager also, are you not?"

"Yes."

"You're fired. Your one share reverts. Don't try to go back to your former office; just get your hat and go."

Bruder jumped up. Thorby turned to him. "You, too. Sergeant-at-Arms, escort them out of the building."

XXIII

Thorby looked glumly at a high stack of papers, each item flagged "URGENT." He picked up one, started to read—put it down and said, "Dolores, switch control of my screen to me. Then go home."

Good girl, there. Loyal, he thought. Well, he hoped. He hadn't dared use a new broom all the way; the administration had to have continuity. He signaled a number.

A voice without a face said, "Scramble Seven."

"Prometheus Bound," Thorby answered, "and nine makes sixteen."

"Scramble set up."

"Sealed," Thorby agreed.

The face of Wing Marshal "Smith" appeared. "Hi, Thor."

"Jake, I've got to postpone this month's conference again. I hate to—but you should see my desk."

"Nobody expects you to devote

your entire time to corps matters."

"Doggone it, that's exactly what I planned to do—clean this place up fast, put good people in charge, grab my hat and enlist for the corps! But it's not that simple."

"Thor, no conscientious officer lets himself be relieved until his board is all green. We both knew that you had lots of lights blinking red."

"Well . . . all right, I can't make the conference. Got a few minutes?"

"Shoot," agreed "Smith."

"I think I've got a boy to hunt porcupines. Remember?"

"Nobody eats a porcupine."

"Right! Though I had to see a picture of one to understand what you meant. To put it in trader terms, the way to kill a business is to make it unprofitable. Slave-raiding is a business, the way to kill it is to put it in the red. Porcupine spines on the victims will do it."

"If we had the spines," the "X" Corps director agreed dryly. "You have an idea for a weapon?"

"Me? What do you think I am? A genius? But I think I've found one. Name is Joel de la Croix. He's supposed to be about the hottest thing M.I.T. ever turned out. I've gossiped with him about what I used to do as a fire-controlman in *Sissu*. He came up with some brilliant ideas without being prodded. Then he said, 'Thor, it's ridiculous for a ship to be put out of action by a silly little paralysis beam when it has enough power in its guts to make a small star.'"

"A *very* small star. But I agree."

"O.K. I've got him stashed in our Havermeyer Labs in Toronto. As soon as your boys O.K. him, I want to hand him a truckload of money and give him a free hand. I'll feed him all I know about raider tactics and so forth—trance tapes, maybe, as I won't have time to work with him much. I'm being run ragged here."

"He'll need a team. This isn't a home-workshop project."

"I know. I'll funnel names to you as fast as I have them. Project Porcupine will have all the men and money it can use. But, Jake, how many of these gadgets can I sell to the Guard?"

"Eh?"

"I'm supposed to be running a business. If I run it into the ground, the courts will boost me out. I'm going to let Project Porcupine spend megabucks like water—but I've *got* to justify it to directors and stockholders. If we come up with something, I can sell several hundred units to Free Traders, I can sell some to ourselves—but I need to show a potential large market to justify the expenditure. How many can the Guard use?"

"Thor, you're worrying unnecessarily. Even if you don't come up with a superweapon—and your chances aren't good—*all* research pays off. Your stockholders won't lose."

"I am *not* worrying unnecessarily! I've got this job by a handful of votes; a special stockholders' meeting

could kick me out tomorrow. Sure research pays off, but not necessarily quickly. You can count on it that every credit I spend is reported to people who would love to see me bumped—so I've got to have reasonable justification."

"How about a research contract?"

"With a vice colonel staring down my boy's neck and telling him what to do? We want to give him a free hand."

"Hm-m-m . . . yes. Suppose I get you a letter-of-intent? We'll make the figure as high as possible. I'll have to see the Marshal-in-Chief. He's on Luna at the moment and I can't squeeze time to go to Luna this week. You'll have to wait a few days."

"I'm not going to wait; I'm going to assume that you can do it. Jake, I'm going to get things rolling and get out of this crazy job—if you won't have me in the corps, I can always be an ordnanceman."

"Come on down this evening. I'll enlist you—then I'll order you to detached duty, right where you are."

Thorby's chin dropped. "Jake! You wouldn't do that to me!"

"I would if you were silly enough to place yourself under my orders, Rudbek."

"But—" Thorby shut up. There was no use arguing; there was too much work to be done.

"Smith" added, "Anything else?"

"I guess not."

"I'll have a first check on De la Croix by tomorrow. See you."

Thorby switched off, feeling glummer than ever. It was not the Wing Marshal's half-whimsical threat, nor even his troubled conscience over spending large amounts of other people's money on a project that stood little chance of success; it was simply that he was swamped by a job more complex than he had believed possible.

He picked up the top item again, put it down, pressed the key that sealed him through to Rudbek estate. Leda was summoned to the screen. "I'll be late again. I'm sorry."

"I'll delay dinner. They're enjoying themselves and I had the kitchen make the canapés substantial."

Thorby shook his head. "Take the head of the table. I'll eat here. I may sleep here."

She sighed. "If you sleep. Look, my stupid dear, be in bed by midnight and up not before six. Promise?"

"O.K. If possible."

"It had better be possible, or you will have trouble with me. See you."

He didn't even pick up the top item this time; he simply sat in thought. Good girl, Leda . . . she had even tried to help in the business—until it had become clear that business was not her forte. But she was one bright spot in the gloom; she always bucked him up. If it wasn't patently unfair for a Guardsman to marry—But he couldn't be that unfair to Leda and he had no reason to think she would be willing anyhow. It was unfair enough for him to duck out of a big dinner

party at the last minute. Other things.

It had all seemed so self-evident: just take over, fumigate that sector facing the Sargony, then pick somebody else to run it. But the more he dug, the more there was to do. Taxes . . . the tax situation was incredibly snarled; it always was. That expansion program the Vegan group was pushing—how could he judge unless he went there and looked? And would he know if he did? And how could he find *time*?

Funny, but a man who owned a thousand starships automatically never had time to ride in even one of them. Maybe in a year or two—

No, those confounded wills wouldn't even be settled in that time!—two years now and the courts were still chewing it. Why couldn't death be handled decently and simply the way the People did it?

In the meantime he wasn't free to go on with Pop's work.

True, he had accomplished a little. By letting "X" Corps have access to Rudbek's files some of the picture had filled in—Jake had told him that a raid which had wiped out one slaver pesthole had resulted directly from stuff the home office knew and hadn't known that it knew.

Or *had* somebody known? Some days he thought Weemsby and Bruder had had guilty knowledge, some days not—for all that the files showed was legitimate business . . . sometimes with wrong people. But who knew that they were the wrong people?

He opened a drawer, got out a

folder with no "URGENT" flag on it simply because it never left his hands. It was, he felt, the most urgent thing in Rudbek, perhaps in the Galaxy—certainly more urgent than Project Porcupine because this matter was certain to cripple, or at least hamper, the slave trade, while Porcupine was a long chance. But his progress had been slow—too much else to do.

Of course, in a tough spot he could always ask himself: "What would Pop do?" Colonel Brisby had phrased that—"I just ask myself, 'What would Colonel Baslim do?'" It helped, especially when he had to remember also what the presiding judge had warned him about the day his parents' shares had been turned over to him: "No man can own a thing to himself alone, and the bigger it is, the less he owns it. You are not free to deal with this property arbitrarily nor foolishly. Your interest does not override that of other stockholders, nor of employees, nor of the public."

Thorby had talked that warning over with Pop before deciding to go ahead with Porcupine.

Garsch stuck his head in. "Still running under the whip? What's the rush, boy?"

"Jim, where can I find ten honest men?"

"Huh? Diogenes was satisfied to hunt for one. Gave him more than he could handle."

"Know any other solution? I'll have each one relieve a manager in

the smelly sector and send the man he relieves back—we can't fire them; we'll have to absorb them. Because we don't *know*. But the new men we can trust and each one will be taught how the slave trade operates and what to look for."

Garsch shrugged. "It's the best we can do. But forget the notion of doing it in one bite; we won't find that many qualified men at one time. Now look, boy, you ain't going to solve it tonight no matter how long you stare at those names. When you are as old as I am, you'll know you can't do everything at once—provided you don't kill yourself first. Either way, some day you die and somebody else has to do the work. You remind me of the man who set out to count stars. Faster he counted, the more new stars kept turning up. So he went fishing. Which you should, early and often."

"Jim, why did you agree to come here? I don't see you quitting work when the others do."

"Because I'm an old idiot. Somebody had to give you a hand. Maybe I relished a chance to take a crack at anything as dirty as the slave trade and this was my way—I'm too old and fat to do it any other way."

Thorby nodded. "I thought so. I've got another way—only, confound it, I'm so busy doing what I must do that I don't have time for what I ought to do . . . and I *never* get a chance to do what I *want* to do!"

"Son, that's universal. The way to keep that recipe from killing you

is occasionally to do what you want to do anyhow. Which is right now. There's all day tomorrow ain't touched yet . . . and you are going out with me and have a sandwich and look at pretty girls."

"I'm going to have dinner sent up."

"No, you aren't."

"But I have to, Jim—I've got responsibilities."

"Sure you have," agreed the old man. "Any citizen has responsibilities. That's what being a citizen is—a man with responsibilities. And if he is a citizen not just of some mud-walled village, but a citizen of the Galaxy—as *you* are—his responsibilities can darn near kill him. Mayhap you had a better time of it as a slave."

"I certainly did!"

"Doubtless. But being a citizen has its compensations, too, and ones a lot more satisfying to a grown man. Howsoever you still can't do it all in one day—even a steel ship has to have time out for maintenance. So come along now."

Thorby looked at the stack of papers. "O.K."

The old man munched his sandwich, drank his lager, and watched pretty girls, with a smile of innocent pleasure. They were indeed pretty girls; Rudbek city attracted the highest-paid talent in show business.

But Thorby did not see them. He was thinking.

A person *can't* run out on responsibility. A captain can't, a chief officer can't. But he did not see how, if he went on this way, he would ever be able to join Pop's corps. But Jim was right; here was a place where the filthy business had to be fought, too.

Even if he didn't like this way to fight it? Yes. Colonel Brisby had once said, about Pop: "It means being so devoted to freedom that you are willing to give up your own . . . be a beggar . . . or a slave . . . or die—that freedom may live."

Yes, Pop, but I don't know *how* to do this job. I'd do it . . . I'm *trying* to do it. But I'm just fumbling. I don't have any talent for it.

Pop answered, "*Nonsense! You can learn to do anything if you apply yourself. You're going to learn if I have to beat your silly head in!*"

"Pop. I'll try."

"*You'll do more than try!*"

"I'll do it, Pop."

"*Now eat your dinner.*"

Obediently Thorby reached for his spoon, then noticed that it was a sandwich instead of a bowl of stew. Garsch said, "What are you muttering about?"

"Nothing. I just made up my mind."

"Give your mind a rest and use your eyes instead. There's a time and a place for everything."

"You're right, Jim."

"*Good night, Son,*" the old beggar whispered. "*Good dreams . . . and good luck!*"

THE END

The trouble with writing articles for Astounding is that you get interested in a subject in direct proportion to the amount you write about it, and start finding it difficult to shake free. For instance, almost a year ago I wanted to write an article about the origin of life. By the time I finished the first draft I found I had to write an article about the origin of the atmosphere first.

Having done that, I find I have just gotten myself in the more deeply. Now I find I must go back even further. After all, there are things about the Earth that are essential to life and that are even more funda-

mental than the existence of an atmosphere.

For instance, Earth is solid, isn't it?

Well, it is, yet there is one piece of evidence which makes it look as though Earth, at some time in the past, has been liquid. Earth consists, you see, of two portions of radically different chemical composition. At the center of the Earth—like the yolk of an egg . . . and in roughly the same proportion—lies a "core" which consists of iron and of substances soluble in iron. About this core lies an outer layer—like the white of an egg—made up of silicates and sub-

THE WHENABOUTS

Once men spoke of "the eternal mountains." Geologists changed that idea. There remained "the everlasting stars" ...until astrophysicists investigated more carefully. Atoms, however, last forever...don't they?

BY ISAAC ASIMOV

stances which are soluble in silicates. (There may be a thinnish layer in between made up of iron sulfide.)

If Earth were liquid at one time, this state of affairs would be quite reasonable. Earth would not have consisted of a single liquid mixture of everything in and on the Earth; it would not, in other words, be a "one-phase system." It would be made up of two liquid phases; an iron phase and a liquid phase. Everything else would dissolve in one phase or the other, or to some extent in both. These two phases would be mutually insoluble, like oil and water. The iron phase is some three times as dense as the silicate phase

so it would settle to the center of the planetary mass. The light silicate phase would rise to the top—like cream in unhomogenized milk—and float on the iron.

If the Earth had never been liquid but had been solid throughout its history, this iron/silicate stratification might still take place, but it would take enormous time and make for a much more complicated situation in general. Just for fun, let's stick with the "liquid-Earth-in-the-beginning" notion and see where that takes us.

The first question is whether the idea of a liquid Earth is reasonable at all. The answer to that depends

and having ended as a solid globe of matter, must have passed through a liquid stage. A liquid Earth would then be not only reasonable; it would be an unavoidable necessity.

But there's trouble there. Solar catastrophes have gone out of fashion. Not only can the dynamics of the Solar System not be explained by solar catastrophes, no matter how many bugger factors are introduced—and some fancy ones have been—but it seems that material shot out of the Sun would never coalesce but would merely expand and expand and expand and become interstellar matter.

OF RADIOACTIVITY

partly on the kind of process that was responsible for forming the Earth.

There are two general types of hypotheses concerning the origin of the Earth. One is the "creation by solar catastrophe" hypothesis. The Sun passed near another star, or collided with one, or had a companion that collided with one, or had a small explosion nova-fashion. In any case, matter was flung out, or pulled out, of the Sun or of a nearby star, and this matter coalesced, cooled down, and became the planets and satellites of today.

If this were so, then naturally the Earth, having started as Sun-hot gas

The second type of hypothesis—and actually the older of the two—is "creation by gradual accumulations." In other words the Universe is considered to have started as a conglomeration of individual atoms. These hit one another and sometimes stick together to form tiny solid particles that slowly grow.

The mutual gravitation of these particles causes them to break up into turbulent Galaxy-sized portions. Within these portions, knots of local concentrations are formed and out of these grow the stars. (There seems good evidence that this sort of star-formation has been continuing steadily ever since the Universe be-

gan and is in progress today in suitable part of our own Galaxy and of others.)

As the particles at the center of each particle-cloud collect into a mass, the process speeds up autocatalytically because the gravitational field becomes more intense. The kinetic energy of particles falling inward into the growing "proto-star" is converted to heat and the temperature rises. Eventually, the temperature and internal pressure of the mass of matter gets high enough to start thermonuclear reactions going, and the proto-star becomes a star.

Meanwhile, in the outer regions of the original cloud are formed subsidiary centers of much smaller accumulations and these form the planets and their satellites.

Theories of this type haven't had all the bugs ironed out of them, either, but they're leading the pack at the moment.

The "creation by gradual accumulation" hypothesis, however, need not imply the existence of a liquid Earth ever in its history. Solid particles getting together can, conceivably, simply form a solid planet. To form a liquid planet out of solid particles requires a source of heat, and a *large* one. The primitive sun, as a source of heat, is not likely. It isn't hot enough to melt Earth now—fortunately—and it was undoubtedly cooler in those early days.

The kinetic energy of particles falling together to form the solid Earth would be converted to heat and I suppose that is a possible source of

the heat. Certainly that is enough to heat the Sun to the thermonuclear kindling point. However, the Earth is a minute mass in comparison to the Sun. There is far less kinetic energy involved in Earth's formation than in the Sun's, and we ought to look further.

Fortunately, there is one other massive source of energy available—radioactivity. As the Earth is formed, its accumulating matter would trap a certain number of radioactive atoms. A number of these radioactive atoms would be breaking down at any given moment. Each atom, as it broke down would liberate an amount of energy many billions of times greater than that represented by the kinetic energy with which it struck the growing Earth in the first place.

In fact, the internal heat of the Earth today almost certainly originates from the breakdown of radioactive atoms that make up part of its structure today—so we may have something.

But certainly Earth's radioactivity isn't enough to liquefy it,—not today, anyway. Earth isn't liquid now and definitely hasn't been for at least three and one half billion years into the past. Why then should radioactivity have liquefied it in the beginning? Or, if somehow radioactivity did do that, why isn't Earth still liquid? Why has it solidified?

Let's see.

I can begin by considering the most familiar radioactive element of

all, which is also the first element discovered to be radioactive—uranium. The radioactive properties of a particular uranium atom depend on the structure of its nucleus, and not all uranium atoms are the same in that respect.

For every element there are a number of possibilities, as far as nuclear structure is concerned. Some of these possibilities may be stable, some unstable. (The unstable ones rearrange themselves into stable forms, sometimes giving off a photon of energy, sometimes shooting out particles or combinations of particles from the nuclei. This is radioactivity.)

An atom with a particular nuclear structure is referred to as a nuclide. A particular nuclide is expressed by the name—or symbol—of the element of which it is a variety, together with a number representing the total number of protons plus neutrons present in its nucleus.

For instance, uranium, as it occurs naturally, is made up almost entirely of two nuclides, uranium-238 and uranium-235. Of the two, uranium-238 is by far the more common. Out of every thousand uranium atoms, nine hundred ninety-three are uranium-238, only seven are uranium-235. So, for the moment, let's concentrate on uranium-238.

An individual uranium-238 atom is unstable. That is, if you wait long enough, its nucleus will explode and eject a small part of its contents. What is left of the atom will then no longer be uranium-238.

But how long a wait is "long enough?" If you're watching a single uranium-238 atom, there is no way to tell. You may have to wait less than a second for the breakdown; you may have to wait more than a trillion years.

However, if you're dealing with a number of uranium-238 atoms, you can predict with good accuracy—the greater the number, the better the accuracy—how many would explode during the next second; or how many would explode between 2:00 and 3:00 p.m. of next Tuesday.

For instance, if you begin with exactly one pound of perfectly pure uranium-238, you are quite safe in predicting that 5,500,000 atoms of uranium-238 will explode each second. You can't predict which individual atoms will do this, but you know the figure. (This is statistics, you see—the magic system by which insurance companies can predict how many Americans are dying each second, and adjust their rates accordingly, even though they could never in the world tell for sure when any one particular healthy American will die.)

At a 5,500,000 atom per second breakdown, it may sound to you as though the pound of uranium does not have long for this world, but if so, you are quite wrong. There are about 1,200,000,000,000,000,000,000,000 atoms in that pound altogether, so what are a few million atoms per second?

In fact, if uranium-238 atoms broke down indefinitely at the rate

of 5,500,000 a second, half the pound of uranium would be gone in three and one third billion years; not before. Even that figure is an underestimate because uranium-238 atoms do *not* break down at a steady rate. The rate varies directly as the number of intact uranium-238 atoms varies. As soon as some of the uranium-238 breaks down, less intact atoms are left, and the rate decreases.

Of course, the rate falls off so slowly that, as far as such a puny stretch of time as, say, the lifetime of a giant sequoia is concerned, the rate is just about constant. A pound of uranium-238 breaking down at the rate of 5,500,000 per second, would still be breaking down at the rate of 4,750,000 per second a billion years hence. A fourteen per cent decline in a billion years isn't much.

Nevertheless, the decline is sufficient to make it necessary for four and one half billion years to pass before half that pound of uranium was gone; not the three and one third billion that would have been necessary if the breakdown rate had remained constant. Furthermore, when half a pound of uranium is left, the breakdown rate has also decreased to half so that it takes another four and one half billion years for half of that half-pound to go; then another four and one half billion years for half of the quarter-pound to go, and so on.

The four and one half billion year period is the "half-life" of uranium-238. Starting with a certain amount of uranium-238 and knowing its

half-life it is possible to calculate how much uranium-238 there will be left at any particular time in the future. It is also possible to calculate how much uranium-238 there was at any time in the past to account for the quantity that is left now. The mathematics involved is simple enough for me to handle, so it's very simple.

Every radioactive nuclide has its own characteristic half-life and the rate of its breakdown varies accordingly. For instance, the less common uranium nuclide, uranium-235, is also unstable and has a half-life of a mere 710,000,000 years. This is less than one sixth the half-life of its big brother. This is just another way of saying that uranium-235 is breaking down at more than six times the rate of uranium-238. A pound of pure uranium-235 would be undergoing 35,000,000 breakdowns per second.

We can move in the other direction by focusing on the second element discovered to be radioactive—thorium. Naturally-occurring thorium consists, for all practical purposes, of a single nuclide, thorium-232. Its half-life is 13.9 billion years, or about three and one fourth times as long as that of uranium-238. It follows that thorium 232 is breaking down that much less frequently. A pound of pure thorium-232 would undergo only 1,800,000 breakdowns per second.

To calculate the amount of radioactivity present in the Earth right

now, we can begin by listing the radioactive nuclides that exist in the Earth. You'll find them in Table 1, together with the half-life of each.

TABLE I

Radioactive Nuclides Existing
on Earth Today

<i>Nuclide</i>	<i>Half-life (in years)</i>
Bismuth-209	200,000,000,000,000,000
Calcium-48	20,000,000,000,000,000
Zirconium-96	20,000,000,000,000,000
Neodymium-150	10,000,000,000,000,000
Neodymium-144	2,000,000,000,000,000
Indium-115	600,000,000,000,000
Tungsten-180	300,000,000,000,000
Vanadium-50	100,000,000,000,000
Platinum-190	1,000,000,000,000
Samarium-147	130,000,000,000
Lanthanum-138	110,000,000,000
Rhenium-187	50,000,000,000
Rubidium-87	50,000,000,000
Lutetium-176	30,000,000,000
Thorium-232	14,000,000,000
Uranium-238	4,500,000,000
Potassium-40	1,300,000,000
Uranium-235	710,000,000

Some of the half-lives are tremendously long and nuclides of that sort break down very rarely. For instance, a pound of pure bismuth-209 will undergo only ten breakdowns per second and its radioactivity was only detected in 1954. Extremely long half-lives are very hard to determine and some of the bigger figures in Table 1 are just rough guesses, really.

It may be that Table 1 isn't complete. A few more nuclides with super-Methusaleh half-lives may be detected. Tellurium-130, for instance, has been reported to have a half-life at least five thousand times longer than that of bismuth-209. At least! If so, a pound of pure tellurium-130

will undergo not more than a single radioactive breakdown per day. Obviously, the contribution of such nuclides to Earth's radioactivity can be ignored, and I will ignore it accordingly.

There are also nuclides with shorter half-lives than any of those in Table 1. For one thing, nuclear physicists have created over a thousand radioactive nuclides in the laboratory with half-lives ranging from the millions of years down to millionths of a second. For the most part, these short-lived radioactive nuclides do not exist on Earth naturally and they can also be ignored.

Some of the exceptions, like carbon-14—half-life, fifty-six hundred years—or hydrogen-3—half-life, twelve and one-fourth years—are formed continuously by cosmic-ray action on the atoms of the upper atmosphere, so they do exist only in Earth's outermost skin, however, in the air, the oceans and the top few feet of its soil. Even there, they exist in very small quantities. They can be ignored also.

However, one group of short-lived radioactive nuclides can *not* be ignored, and there's a small explanation that goes along with that.

Of the nuclides listed in Table 1, all but thorium-232, uranium-235 and uranium-238 break down once and that's all. By virtue of that single breakdown they are converted into stable nuclides that break down no further.

Uranium-238, however, in breaking down, changes into a nuclide

that is not stable but is itself radioactive. This second nuclide breaks down further to a third nuclide, still radioactive, which breaks down in its turn, and so on. Eventually, after a number of breakdowns, the stable nuclide, lead-206, is produced and that breaks down no further.

Any sample of uranium-238, therefore, however pure to begin with, is always producing these intermediate radioactive nuclides, "daughter nuclides" so to speak, which contribute to the total radioactivity of uranium-238 as found in Nature. All the daughter nuclides are short-lived, and, therefore, break down at tremendous rates. The longest-lived of them has a half-life of two hundred fifty thousand years—long for us but not long for an atom—and consequently breaks down twenty thousand times faster than does uranium-238. The shortest-lived daughter nuclide has a half-life of less than a thousandth of a second and it breaks down trillions of trillions of times faster.

The daughter nuclides are present in only tiny quantities in uranium. They build up to "radioactive equilibrium" and after that accumulate no further, since they then reach the point where they break down just as fast as they are formed. Only the stable lead-206 accumulates with time.

The story is very similar for uranium-235, which has its own set of daughter nuclides different from those of uranium-238; and for thorium-232, with still a third set.

But, although these daughter nuclides are important and cannot be ignored, there is no point in worrying about them separately. Each set accompanies its parent nuclide and shares its fate. If there is more or less uranium-238, there are more or less of the daughter nuclides in exact proportion.

Later on in the article, when I calculate the actual heat production involved in the breakdown of the uranium and thorium nuclides, I will calculate it all the way to the production of the stable lead isotopes. This will automatically take into account the heat produced by the daughter nuclides and we will not be ignoring them.

Now that the radioactive nuclides are listed, the next question is how much of Earth's radioactivity is due to each one separately and to all of them together. One of the factors on which this depends is on how much of each nuclide in question is present in the Earth.

There are some fairly reliable figures for the chemical make-up of the Earth's crust, but the crust isn't a good sample of the Earth's constitution as a whole. Unfortunately, direct analysis of the Earth's interior, which would balance the figures for the crust, is, as yet, impossible.

However, a number of chemical analyses have been conducted on meteorites and it may just be reasonable to hope that the overall composition of a number of meteorites may resemble that of the Earth as a whole.

There are iron meteorites with a composition resembling what we expect of the Earth's core; and there are stony meteorites whose composition resembles that of the Earth's crust. (Are the meteorites remnants of an exploded planet which had already gone through its liquid stage and separated into iron and silicate phases?)

Once we have the figures for the elementary composition of any object, it is easy to figure out the concentration of any particular nuclide. Every element is made up of one or more nuclides in known proportions, and I gave an example of this earlier in the case of uranium. These proportions can make quite a difference. For instance, potassium is one of the most common elements, but the radioactive nuclide, potassium-40 isn't at all common. For every ten thousand potassium atoms, nine thousand three hundred and eight are the stable nuclide, potassium-39; six hundred ninety-one are the stable nuclide, potassium-41; and only one is the radioactive nuclide, potassium-40.

From meteorite data and from nuclide proportions within elements, I have worked up Table 2, which is an attempt to guess reasonably at the relative proportions of the various radioactive nuclides present in the Earth, both by atom and by weight.

Calculating by weight introduces a bias toward the heavier nuclides. For instance, there are three times as many potassium-40 atoms in the Earth as there are uranium-238

TABLE II

Radioactive Nuclides in the Earth

<i>Nuclide</i>	<i>Atoms present for every 10 billion in the Earth</i>	<i>Pounds per thousand cubic yards of Earth</i>
Calcium-48	1,500,000	2,380
Thorium-232	91,000	705
Zirconium-96	60,000	190
Uranium-238	35,000	276
Rubidium-87	31,000	90
Neodymium-144	12,200	57.4
Potassium-40	10,800	14.3
Vanadium-50	4,800	8.0
Indium-115	3,400	12.9
Neodymium-150	2,900	14.5
Samarium-147	2,700	13.1
Tungsten-180	310	2.04
Uranium-235	250	1.95
Lutetium-176	190	1.10
Lanthanum-138	29	0.130
Rhenium-187	17	0.105
Bismuth-209	15	0.105
Platinum-190	4	0.025

atoms. However, the individual uranium-238 atom is six times as heavy as the individual potassium-40. Consequently, the weight of uranium-238 in the Earth is twice that of the potassium-40. (Of course, you might also say that calculating by atom introduces a bias toward the lighter nuclides.)

As you can see from Table 2, the total number of radioactive nuclides in Earth comes out just over one million seven hundred fifty thousand per ten billion atoms. That means that about one atom out of every six thousand in the planet is potentially radioactive. Or, since one thousand cubic yards of average Earth material—counting in the iron core as well as the silicate crust—comes to a weight of four thousand six hundred forty

tons—it turns out that there are about twelve ounces of radioactive material to the ton of Earth.

However, these are spurious figures. About two thirds of the weight of radioactive nuclides is made up of calcium-48 which has a half-life forty million times as long as that of uranium-238. It is, therefore, only a forty millionth as radioactive. Despite its presence in quantity it contributes little to Earth's heat.

In fact, to weigh the nuclides properly, occurrence and half-lives must both be taken into account. These can be used to calculate the number of breakdowns per second in a thousand cubic yards of Earth for each of the nuclides under discussion. This will give a truer picture of the contribution each makes to Earth's radioactivity. This is done in Table 3.

TABLE III

Radioactive Breakdowns in the Earth

Nuclide	<i>Breakdowns per second in a thousand cubic yards of Earth</i>
Potassium-40	1,600,000,000
Uranium-238	1,500,000,000
Thorium-232	1,270,000,000
Rubidium-87	122,000,000
Uranium-235	68,000,000
Samarium-147	4,200,000
Lutetium-176	1,200,000
Rhenium-187	66,000
Calcium-48	15,000
Vanadium-50	10,000
Neodymium-144	1,200
Indium-115	1,100
Platinum-190	800
Zirconium-96	600
Tungsten-180	230
Neodymium-150	60
Lanthanum-138	50
Bismuth-209	0.01

Several interesting things turn up in Table 3. In the first place, the total number of breakdowns per second in a thousand cubic yards of Earth seems appallingly high—nearly five billion. It almost sounds as though radiation sickness were just around the corner.

Well, it's not quite that bad. For one thing, there are so many atoms in a thousand cubic yards of Earth that only one atom out of sixty billion trillion is breaking down each second.

Actually, in an average pound of Earth* there are only six hundred breakdowns per second. Or, if you count in the breakdowns of the small quantities of very unstable daughter nuclides arising from uranium and thorium, the total number would be four thousand per second. Compare this with the five million five hundred thousand breakdowns per second in a pound of uranium-238—or seventy-seven million, if you count in the breakdowns among the daughter nuclides.

Furthermore, virtually all the radioactivity of Earth is absorbed by the Earth itself and is converted into heat. Very little escapes through the surface and hits us, so the only radiation sickness we have to worry about is what we create ourselves with our pleasant little hydrogen bombs.

Another thing apparent from the table is that 99.9 per cent of the radioactive breakdowns in the Earth

*I hope you notice the capitalization. A pound of Earth is not the same as a pound of earth by any means. The latter is outermost crust only while the former is a well-mixed, or homogenized, sample of the whole planet.

is the result of the instability of just five nuclides: potassium-40, uranium-238, thorium-232, rubidium-87 and uranium-235 in that order. The rest, no matter how common individuals among them may be, contribute not more than one-thousandth of the total planetary radioactivity and can be dismissed.

I'm still not being quite fair. The number of breakdowns is all very well, but the important thing is the energy produced. From the standpoint of the effect on heating the Earth, one energetic breakdown can be more important than ten very mild ones.

Fortunately, it is possible to calculate the energy production for each type of nuclide breakdown without undue brain-strain.

Take the case of rubidium-87. Its exact mass—in atomic mass units—is 86.93687. When it breaks down, it is converted to strontium-87—a stable nuclide—which has a mass of 86.93613.

In the process, you see, 0.00074 units of mass has "disappeared"; that is, it has been converted into energy.

The energy developed as a result of the conversion of that quantity of mass can be calculated by using the equation: $E = mc^2$. The quantity, c , is the speed of light in centimeters per second and c^2 turns out to be 8.98661×10^{20} cm²/sec². If we multiply that by 0.00074, we come out with the number of ergs—an energy unit—produced by the breakdown

of one mole— 6.02×10^{23} atoms—of rubidium-87. Knowing that we can calculate the energy produced by the breakdown of any number of rubidium-87 atoms.

Uranium-238 breaks down in more complicated fashion. It ends up as lead-206, but in the process, it and its daughter nuclides, among them, produce eight alpha particles—which are helium-4 nuclei—for each lead-206 produced.

The mass of uranium-238 is 238.12522. That of lead-206 plus eight helium-4 is 238.06979 and the mass discrepancy is 0.05543. This is seventy-five times as great as the mass loss in rubidium-87 breakdown and the energy produced per breakdown is also seventy-five times as great.

For each of the nuclides, the energy given off per million breakdowns can be calculated in this fashion, and the results are given in Table 4.

TABLE IV

Energy Production of Various
Radioactive Nuclides

Nuclide	Ergs of energy produced per million breakdowns
Uranium-238	82.6
Uranium-235	74.3
Thorium-232	69.5
Potassium-40	2.15
Rubidium-87	1.10

With the information in Table 4, it is possible to calculate the ergs produced by each nuclide each second in a thousand cubic yards of Earth

and that is given in Table 5. Notice that in terms of energy production, rubidium-87 sinks into insignificance,

TABLE V

Radioactive Energy Production
in the Earth

<i>Nuclide</i>	<i>Ergs produced per second in a thousand cubic yards of Earth</i>
Uranium-238	124,000
Thorium-232	88,200
Uranium-235	5,100
Potassium-40	3,400
Rubidium-87	130
Total	220,830

and we needn't worry about it any more. Only the big four need concern us.

Now that we have some notion as to the energy production of radioactivity in the Earth today, we can extend that knowledge into the past.

For instance, grant that there is a given amount of uranium-238 in the Earth today. Its half-life is four and one half billion years. That means that four and one half billion years ago, there was twice as much uranium-238 present in the Earth as there is now. For every radioactive breakdown per second uranium-238 causes in the Earth now, it was causing two breakdowns per second then. For every erg per second it produces now, it was producing two ergs per second then.

For a nuclide with a longer half-life, the buildup, as we move into the past, is not as rapid (just as the decline as we move into the future

is not as rapid). Thorium-232, with a half-life of fourteen billion years would double in quantity only if we moved fourteen billion years into the past. A mere four and one half billion years ago, there would only have been about one-fourth more thorium-232 on Earth than there is now.

On the other hand, uranium-235 would exist in twice the present quantity only seven hundred ten million years ago. If we moved back four and one half billion years, uranium-235 would have had a chance to double and double again and again about six times altogether. There would be some seventy times as much of it then as there is now.

Knowing half-lives and present quantity of any nuclide, it is possible to calculate backward to any time in the past and determine the quantity (and hence, energy production) then as compared with now. Specifically, we can calculate back to the time of the formation of the Earth.

But first, how long ago was Earth formed? The oldest rocks on Earth whose ages have been measured appear to have existed in solid form for somewhere between three and one half billion and four billion years, and Earth must undoubtedly be older than that. By the "formation through gradual accumulation" hypothesis, the Earth is as old as the Sun and astrophysicists now pin a possible age of five billion years on the Sun.

That's a nice figure. I'm willing to adopt it. So now let's calculate the energy production per second in

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a thousand cubic yards of Earth and compare it with the present. This is done in Table 6.

TABLE VI

Radioactive Energy Production
at Time of Earth's Formation

Nuclide	Energy Production (ergs/second/1000 cubic yds.)	Loss of nuclide since formation of Earth
	five billion years ago	
Uranium-235	670,000	99.9%
Uranium-238	257,000	51.5%
Thorium-232	113,000	22.0%
Potassium-40	48,400	93.0%
Total	1,088,400	79.8%

The main point made by Table 6 is that at the time of the formation of the Earth, the energy production due to uranium-235 was responsible for more than sixty per cent of all radioactive energy production and that total radioactive energy production was just about five times as high at the time of Earth's formation as it is now.

Furthermore, it is uranium-235 decay which is responsible for most of the decline in radioactive energy production. Of all the radioactive nuclides that have disappeared in Earth's five billion years history, five out of eight have been uranium-235 (and its daughter nuclides).

Before I go any further, though, is it possible that I am missing a bet? Perhaps some nuclide, still shorter-lived than uranium-235, might have been present in the Earth at its formation and have contributed to

radioactive energy production. To be sure, no such nuclide exists in Nature today, but that's the very point. It would have decayed so rapidly that none would be left now.

Let's see.

The longest-lived nuclides that we know of with half-lives *shorter* than that of uranium-235 are listed in Table 7. There are only six nuclides,

TABLE VII

The Medium-Lived Nuclides

Nuclide	Half-Life (years)
Plutonium-244	70,000,000
Samarium-146	50,000,000
Lead-205	50,000,000
Uranium-236	24,000,000
Iodine-129	17,000,000
Tantalum-180	10,000,000

as you see, known to have half-lives of ten million years or more below the uranium-235 mark and the longest-lived of them has a half-life of only seventy million years. (It is extremely unlikely that any nuclides in the ten million and up half-life range remain yet to be discovered.)

Now, none of the medium-lived nuclides is likely to have been formed in high quantity at the beginning. They are all heavy nuclides which, in general—judging from the similar but stable nuclides that exist today—were formed in very small quantities.

Before trying to set figures to the "small quantities," let's ask another question: When were the various nuclides created anyway? The most recent estimates I have seen place the initial explosion of the original cosmos—of which the expanding uni-

verse is still the witness—at six billion years in the past. The initial explosion is supposed to have formed the atoms as we know them today.

The atoms are, by that reckoning, one billion years older than the Solar System and that is a nice figure to accept.

Now, then, the important heavy radioactive nuclides, uranium-235, uranium-238 and thorium-232, today make up a total of only thirteen atoms out of every million in the Earth. (See Table 2.) If we count in the number that would have been present except for the breakdowns that went on during the six billion years since the atoms were formed, there would have been twenty-two of these out of every million.

Let's be generous now. Let's suppose that each one of the medium-lived nuclides in Table 7 was originally formed in a quantity equal to uranium-235, uranium-238 and thorium-232 combined. Let each of the six be common enough to form twenty-two for every million atoms. This is certainly being generous.

But remember, the formation of the atoms took place six billion years ago; the formation of the Earth only five billion years ago. There is a one billion year gap during which these medium-lived nuclides had a chance to break down. For instance, half the plutonium-244 was gone seventy millions years after it was originally formed and nine hundred thirty million years *before* the Earth was formed. When two hundred million years had passed after the formation

of the atoms and eight hundred million years must yet elapse before Earth is formed, some eighty-five per cent of the plutonium-244 has already gone. The situation is, of course, worse for the other still shorter-lived nuclides.

We can calculate how much of each is left at the time of the formation of the Earth, assuming a starting concentration of twenty-two in a million for each. It turns out that for plutonium-244, the amount left at the time of the formation of the Earth is only about one hundred atoms per ten billion, or only about two-fifths the quantity of the uranium-235 remnant present in the Earth today. The quantity of the other nuclides present in the Earth when formed is negligible.

To be sure, the plutonium-244 breaks down at a rate considerably greater than the longer-lived nuclides; ten times as fast as uranium-235 and two hundred times as fast as thorium-232, so its low concentration may not prevent it from making a contribution to energy production that is not entirely negligible.

We can allow for that, too. Plutonium-244 breaks down to thorium-232, producing three helium-4 nuclei on the way. Once thorium-232 is produced, the rate of further energy production becomes very small. Going from plutonium-244 to thorium-232, however, the energy production in ergs per second per thousand cubic yards of Earth is about nine hundred fifty.

Even if you were to add a couple

of hundred ergs per second for the dregs of the other medium-lived nuclides that might be about, it would still represent an insignificant quantity of the total radioactivity energy production on Earth at the time of its formation. And that is after having assumed a figure for the original quantity of these nuclides that is surely many times too high. So it's obvious we can stick with the figures in Table 6 and not worry about other nuclides at all.

But how significant is the radioactive energy production in Earth. In Table 5, the figure for such energy production in a thousand cubic yards of Earth—over forty-five hundred tons of material—is over two hundred twenty thousand ergs per second.

An erg, however, is a very small unit of energy. It takes over forty-one billion ergs to make one kilocalorie, and a kilocalorie isn't a terribly large unit of energy, either. For instance, it takes about thirty kilocalories of energy to raise the temperature of an ounce of ice water to the boiling point. The burning of an ounce of gasoline will produce about three hundred kilocalories of energy. It takes an absolute minimum of seventeen hundred kilocalories to keep a human being going for one day.

Well, then, the energy production of a thousand cubic yards of Earth, once you convert from ergs to kilocalories, comes to about 0.0000051 kilocalories per second. It would take

that thousand cubic yard section two years to produce the energy of a burning ounce of gasoline and about eleven years to produce the energy needed to keep you just barely going for one day.

Not much, I admit, but then there is a great quantity of such thousand-cubic-yard sections in the Earth, one and one half billion billion, in fact.

The total amount of energy produced by radioactivity in the Earth amounts to seven and a half trillion kilocalories per second.

To give an idea of how much *this* is, compare it with the energy received by the Earth from the Sun. It amounts, all told, to about forty trillion kilocalories per second, but of this some forty per cent is reflected, leaving only some twenty-four trillion kilocalories per second to be absorbed.

The solid surface of the Earth received, therefore, energy from the planetary interior that is almost one third as much as the energy it receives from the Sun.

Furthermore, the Sun's energy affects only atmosphere, oceans, and the outermost skin of the land surface. It is intermittent and what is received during the day is radiated away during the night. Earth's internal heat never lets up, but is produced relentlessly day and night, and is distributed throughout the silicate crust of the Earth. Still worse, the Earth's substance is a very poor conductor of heat. By measuring the rate at which temperature goes up as one burrows into the Earth, it has

been calculated that Earth loses a little over three billionths of a kilocalorie per second for each square centimeter of Earth's surface.

This is a most puzzling figure, because it is admitted that the heat production through radioactivity in the surface skin alone of the Earth—say the outer ten to twenty miles . . . or about one per cent of the Earth—supplies almost enough heat to make up for this heat loss.

The total heat loss of Earth, at three billionths of a kilocalorie per square centimeter per second comes out to only about sixteen billion kilocalories per second. This is only one fifth of one per cent of the energy production by radioactivity.

If the basic figures used in this article are correct, we have left, then, an ample supply of energy to account for volcanoes, for earthquakes, for mountain-building and all the various geological processes that must consume enormous amounts of energy.

The problem is not to find enough energy to explain geological phenomena. The problem is to find enough phenomena to consume the energy produced by Earth's radioactivity.

And when we think that radioactive energy production was five times as high when Earth was formed as it is now, there is no difficulty at all in visualizing the liquefaction of the planet after formation. If difficulty there be, it is in understanding why the silicate crust is solid now.

Specific theories have been advanced to account for changes in

Earth's surface features as a result of the heat production resulting from radioactivity. For instance, it has been suggested that the sub-crustal regions of Earth—say twenty to forty miles down—are melting now as heat accumulates. When the melted area reaches within four miles or so of the ocean floor, enough heat will leak through the thin solid layer and into the ocean to balance the books so that further melting will cease.

Meanwhile the continents, their stony foundations softened, will float westward—very slowly—on the liquid rock ocean as the result of tidal influences, so that the heat accumulated under them will also flow into the ocean. The heat lost will thus become greater than the heat being produced and a cooling-off period will start. The crust will thicken, the continents become fixed once more and heat will start accumulating again. Furthermore, during the hot period, the continents will sink—very slowly—into the softening rock, allowing the formation of warm shallow seas as the ocean invades the land.

A modified theory supposes the heat formation to be more uneven, concentrating—as seems logical—about regions which happen to be higher than average in radioactive isotopes. In this way, a "blister" will form under some section of a continent. (The continents are higher in radioactive material than are the sea bottoms.) This blister, or elevated land area, will be eroded away and serve as the material out of which

mountain chains are formed. Furthermore, this will also be a period of intense vulcanism in which most of the internal heat is carried away from Earth not simply by conduction to the ocean but by the actual spewing of molten rock to the surface, where heat may be lost directly and in quantity to the air. Again this results in a period of cooling.

In either case, the heating/cooling is cyclic. As we go back into the past, the cycles must move constantly in the direction of heat as the amount of radioactive energy production increases. The hot periods must be increasingly violent, with a thinner solid crust, larger blisters, more and bigger volcanoes. Finally, some four billion years ago the hot period must have been hot enough to melt all of the Earth.

There must have been an intermediate period when a thin crust formed as radioactivity died off but didn't remain. A liquid surface can lose heat more quickly through convection—that is, by currents of liquid actively bringing heat from the interior to the surface—than a solid surface can lose it by conduction only.

Once the thin crust formed, therefore, heat would be trapped beneath it and it would gradually melt. The next time the crust would be formed, some of the radioactivity would have decayed away and the crust would be thicker and melt more slowly, and

so on, until finally the solid crust would come for good.

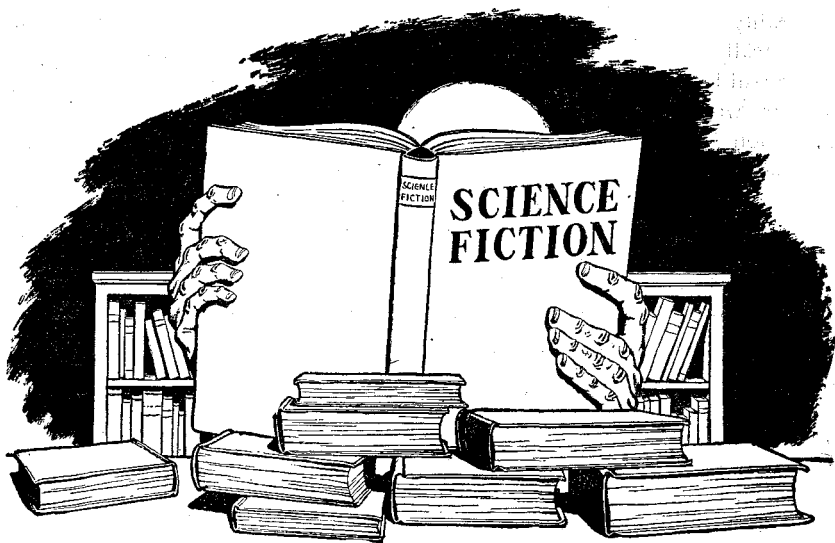
There are a lot of matters left hanging by these theories—or by any theories of mountain-building, vulcanism and Earth's surface changes generally. For instance, do these cyclic heating/cooling periods have any connection with Earth's cyclic glaciation/interglaciation periods?

Unfortunately, this can't be helped. Working out geological theories is a losing game. Not enough is known about the details of Earth's internal structure to give us enough basic knowledge to work with. What's more we don't—at the moment—know of any method for finding out these details.

In fact, in many ways we know more about the internal structure of Betelgeuse and Vega than about the internal structure of the Earth. Aesop tells the story of Thales, the ancient Greek philosopher—and first man to predict an eclipse—who was so interested in studying the stars during an evening stroll, that he fell into a ditch. An old woman, passing by, mocked him by saying, "Here is a man who thinks he can learn about the stars when he doesn't even know what's going on under his feet."

Well, that's exactly what modern science has managed to do. It has learned a great deal about the stars and remained largely ignorant as to what's going on under our feet.

THE END



THE REFERENCE LIBRARY

BY P. SCHUYLER MILLER

STRAWS

IN A

HOT WIND

As this is written, the head-on conflict of two facts is filling the headlines, the TV screens, and the legislatures of the world: (1) Science can't work without facts; (2) Politics can't wait for facts. I doubt that any stable compromise will have been reached

by the time this appears, although somebody may have been forced into doing something of permanent consequence. The results, whichever way the cow wanders, have almost certainly been explored by science fiction.

Not only did SF foresee the possibilities and consequences of nuclear energy, it foresaw most of the stumbling blocks, and Robert Heinlein's "Solution Unsatisfactory," back in 1941, was and is uncomfortably close

to reality. An atomic bomb, we knew, was really just another vastly more powerful bomb whose heat and blast effects would be supplemented by radiation. The lasting danger to individuals and the race would come from what is now known as "fall-out"—Heinlein's atomic dust.

Out of the present controversy, one or two facts have emerged. We don't really know how much fall-out there has been so far, from the American, British and Russian bomb tests since the war. We don't know how much of it will affect human health and human heredity. We don't know what a "safe" intake of radioactive matter is, or whether there is any such thing.

The U.S.S.R., being the kind of place it is, probably doesn't concern itself much with these matters. Under such a regime, to put it flatly, people are expendable: the government isn't. But that is not at all the case in the Western segment of the world, and it's not true in much of the Asiatic sector whose closest natural ties have been with Russia. Japan, in particular, has been hit from all sides, and knows from Hiroshima and Nagasaki what radiation does to people.

You won't find all the facts, such as there are, in any one place. I set out to compile them for this column, and gave it up, but I'd recommend that you watch the weekly, *Science*, if your library has it. "Sleepers"—sober little papers that set down the grimmest of data without hullabaloo or drum-beating—have a way of appearing from time to time, well

ahead of the newspaper headlines.

One book, however, will pretty well bring you up to date as of this spring. It is "Radiation: What It Is and How It Affects You," by Drs. Jack Schubert and Ralph E. Lapp, men who know the atomic field from the inside, who are greatly concerned about the dangers that are piling up, and who spell those dangers out as they see them. The book is published by the Viking Press for \$3.95. As a sort of companion-piece, you can get from the magazine, *Saturday Review*—25 West 45th Street, New York 36—a reprint of a series of articles or statements originally appearing in its issues of May 18th and 25th. The first is an open letter from the great German humanist, Dr. Albert Schweitzer, written at the urging of SR's editor, Norman Cousins, and urging a halt to bomb testing because of the hazards from fall-out radioactivity. This is accompanied by an answer from Dr. Willard F. Libby, spokesman for the Atomic Energy Commission's official viewpoint that we have reached only an insignificant fraction of the danger-level, with a countering comment by Dr. Harrison Brown of California Institute of Technology, and another by SR's science editor, John Lear. Reprints are ten cents each, less in quantities.

What we have, pretty evidently, is a conflict of purpose. One school is convinced, for good reasons that are no news to us since we've played all the changes on them, that bomb testing and bomb making must be stopped, before they lead to a final

war which no society and few people will survive. The other, the AEC position, is that anything we may do to give Russia a lead in atomic armament may bring that war. Both are searching for facts to strengthen their respective stands—and they have to use the same facts.

But in this concentration on their ultimate purpose of atomic disarmament for all nations, it seems to me that Messrs. Cousins, Schweitzer, *et al* are to their own detriment brushing aside another set of facts that the Schubert-Lapp book, and articles now appearing in *Science* and elsewhere, show quite clearly to be a past, present, and ever-growing hazard to us as individuals and to the race. They imply that by ending bomb tests and fall-out, we would end the radiation hazard—and this is just not so, as Lapp and Schubert show clearly. Exposure to X rays, in particular, has become so routine in our daily life that we take them as matter-of-factly as sunshine, without ever concerning ourselves over whether adequate precautions are taken to protect us as individuals from radiation damage, and particularly from mutations in the sex cells which will affect our children and grandchildren.

Group A is propagandizing against bombs and bomb tests. Group B is propagandizing for bombs and bomb tests. Both are sincere; both have good reasons. But both are turning their backs on the seemingly greater dangers, brought out by the same surveys, in waste radiation from peace-

ful atomic reactors and from X rays.

Judging from his earlier work on Carbon-14 dating, Dr. Libby is precisely the mono-directional-minded type of scientist who is an ideal choice for picking over the scant data available, to support the present national policy. When he was running counts of charcoal samples for the world's archeologists, he did not concern himself with anything but the counting. Whether the sample was a good one—whether it was chemically ready for counting—seemed irrelevant: his concern was with the counting apparatus. The rest was somebody else's business—and this is the impression he gives now, in his answers to Schweitzer and others.

Two factors may be worth pointing out. Libby and the AEC seem to have made the assumption that—lacking the evidence that will show the true state of affairs—they will consider that fall-out is uniform the world over, outside the immediate area of a test. What data they—and we—do have is based on samples collected in some eighty-five stations, scattered around the world. But fall-out of Strontium 90 or any other bomb product is as much a function of the weather as is fall-out of water, and we all know of local irregularities so marked that there will be a downpour across the street while the sidewalks on our side are bone-dry. Irregularity, not regularity, is the preponderant feature of nature.

Another type of irregularity is a vital factor that Libby *et al* are ignor-

ing or talking around. This is the statistical irregularity in what we know about human sensitivity to radiation. It is a pure mathematical fact that if the data show that on the average people are safe until they get more than X roentgens of radiation, *half the people counted are not safe at this level*. Hence the empirical safety factors you'll see mentioned: engineers call them "bugger factors," variable constants introduced to turn a wrong answer into the right one.

Let's use an old TVA joke to state it a little more clearly; Canadians are telling it about Americans on the St. Lawrence seaway project, so it's still valid. A TVA engineer, it seems, was charged with designing bridges high enough so the river boats could get under. He made a survey, measured the heights of the smokestacks on all the boats that would use the river, and built the bridges at the average height . . . so that half the boats he had measured couldn't get under at all. It looks as if the AEC is using the same kind of average safety figure in its arguing.

By the same token, I'd be much happier with the statements of such men as Norman Cousins if he gave any indication that he understands the scientific data he uses to support his cause. In a couple of his statements he has used the rather archaic, nineteenth century statement that "highly poisonous radioactive strontium has an affinity for calcium," seeming to believe that Strontium 90 is somehow mystically attracted to the calcium in our bones. Actually, the

point is that strontium and calcium are so similar chemically that both are used by the body in the same way, to build bones and teeth, so that in the case of the "hot" element we get a built-in radioactive source.

Meanwhile, there is an emotional reaction to the whole question for which we can take some responsibility, with our stereotypes of "atomic men" whose glance is death, familiar in Hollywood and TV science fiction and not unknown in the magazines. When employees of a Texas company picked up a small amount of radioactive dust, they found that their whole community shunned them with a kind of blind feeling that radioactivity is somehow contagious. I don't know whether sound, solid, point-with-alarm books like Lapp's and Schubert's will straighten out this attitude or merely encourage it.

I'd also like to recommend, more as an interim reference than as something to read, Gerald Wendt's "The Prospects of Nuclear Power and Technology" (Van Nostrand Co., Princeton, New York, Toronto and London; 348 pp.; \$6.00). This is a matter-of-fact summing up of the status of peacetime atomic energy, as of the end of the Geneva Conference or shortly thereafter. As a reference, it is greatly handicapped by a very bad index; you almost have to read it through in order to know where to look for facts you want to use later. I hadn't realized, for example, that at the end of 1955 the world had no fewer than one hundred fourteen nuclear reactors running or projected.

Put this one beside the Smythe report, if you're willing to dig for the information that is in it. And note well the comments on radioactive wastes from power reactors and such: with all the world's atomic potential turned to peaceful power instead of bombs, the radiation hazard would still be serious and growing more so daily.

What data are to science, policy is to politics. In the present controversy, the indications are that policy is going to outweigh fact. We're going to have to find out how to defend ourselves from our own defenses.

THE SEEDLING STARS, by James Blish. Gnome Press, New York. 1957. 185 pp. \$3.00

As one man's answer to the book-club challenge—earlier this year A. E. van Vogt's new "Empire of the Atom" was released by a cut-rate book club *before* Shasta's "original" edition was published—Marty Greenberg has announced the Gnome Press "pick-a-book" scheme. You'd better write to him at 799 Broadway, New York 3, for details and lists, but in a nutshell you can get the regular Gnome editions for only \$1.33 apiece by ordering three at a time, \$1.25 each in lots of six, and \$1.20 each if you buy by the dozen assorted titles. (Fantasy Press, Box 187, Adamstown, Pa.—a new address, incidentally—also has a bargain offer: paperback dollar editions of some of their best books.)

The short stories and novelettes which James Blish has fitted together in "The Seedling Stars" have been picked up from four very different magazines. I don't know whether he thought of them as a whole from the beginning, or whether the idea grew on him after the success of the best of the parts, "Surface Tension," in *Galaxy*. At any rate, although there is a unified theme or gimmick, what you have in the book is a set of four discreet episodes with little or no real bearing on each other.

The gimmick, as you probably know if you've read any of the parts, is that of "Adapted Men"—made-to-order men, laboratory—designed from the germ cells out to fit the unearthly conditions of unEarthly worlds. If the Universe won't fit Man, Man must fit the Universe. I have very strong reservations, in spite of being no biologist, as to whether the changes could be made as fast as we're told they occur, but I'm quite happy about the basic idea.

In the first section, based on "A Time to Survive" from *Fantasy and Science Fiction*, we meet the Adapted Men holed up on the ice-world of Ganymede, fighting for their identity as a synthetic race, not quite androids and not quite human. Sweeney, planted among them, has the same liquid-ammonia blood, the same diet of rock dust—and, he realizes eventually, the same hopes and visions of the more than human potentialities that "pantropism" has released in mankind.

In the second section—from *If*—

ASTOUNDING SCIENCE FICTION

which has the Lovecraftian title "The Thing in the Attic," we meet an utterly different lot of Adapted Men, one of the many strewn among the star-worlds by the Seeding Program. These are monkeylike, adapted for life in the leafy "attic" of a planetary rain-forest and dreading the Hell of the forest floor to which nonconformists are condemned. We follow one such lot, who have the courage of their nonconformity and discover something about their humanity.

The third and most fascinating section is based on two stories, "Sunken Universe" from *Super Science* of 1942 and *Galaxy's* "Surface Tension." Here we have a race of microscopic, water-breathing men on a water-world of Tau Ceti. Taken by itself, it's probably the best exploitation of the man-grown-tiny gimmick that as far as I know originated with O'Brien's "Diamond Lens," was taken over by Ray Cummings in his "Golden Atom" stories, and was turned into a good movie by Richard Matheson in his "Incredible Shrinking Man." Frankly, I'd have been happier to see the people of Hydrot in a book of their own, instead of fitted into this book.

Finally, in the last few pages—from *If* again—the author closes the orbit of the Adapted Men and brings them back to attempt the colonization of the dying Earth where they originated millennia before, and with the timeless stigma of "differentness" still haunting them.

It's good, original SF as you'd expect, but this is one case where the

whole is not greater than the sum of the parts. For the *new* Blish, whose novel is a novel, see the Balantine "Frozen Year."

STAR BORN, by Andre Norton.
World Publishing Co., Cleveland.
1956. 212 pp. \$2.75

Good, fast-moving, colorful SF adventures are still being written these days, but they're labeled juveniles. The best of them are written by Robert A. Heinlein for Scribner's, but Andre Norton's editing and writing jobs for World are right up there in the pennant race, and she's almost as good for Gnome as "Andrew North" (may I apologize again to her and many, many readers for confusing her with Eric North?).

This is technically a sequel to "The Stars Are Ours!" but it takes place a century or so later, and its hero, Dalgard Nordis, is about a fourfold-great-grandson of the Dard Nordis whose adventures, colonizing the planet Astra, we followed in the first book. By now the human pioneers have "settled into the varnish"—as was once said of the books that lay untouched on the parlor table, disturbed only for weddings and funerals. They have developed their own culture in friendly partnership with the furred amphibians of the undersea villages, who accompany them on quests, hunt dragons with them, and are linked with many of the younger generation telepathically. They know nothing at all about

Those Others, the city-building former rulers of Astra who are said still to survive on the other side of the world.

Dalgard Nordis, bound on a quest with his blood-brother Ssuri of the mermen, runs into evidence that the ogre-race is on the move again, every bit as ruthless and savage as in the legends. And then explorers from Earth, knowing nothing of the former refugee colony, join forces with the race that is obviously the dominant one on the new world—Those Others. Miss Norton misses few of the possibilities of the situation, if any. It's a good yarn, of the kind that ought to win friends and influence future readers.

COMING ATTRACTIONS, edited by
Martin Greenberg. Gnome Press,
New York. 1957. 254 pp. \$3.50

Here's a book that deserves a special Hugo from the next World Science Fiction Convention, and maybe special mention from the International Fantasy Award committee, if it is still functioning.

It is no news to readers of this magazine that some of the most original and thought-provoking scientific articles now being published appear in the science-fiction magazines. John Campbell set the pace here, of course, but just about all of the best-edited magazines have an occasional article and Willy Ley's department in *Galaxy* provides as good a series as you'll find. What's

more, the fanzines have produced their share, though they're done more in the bibliographical and critical fields than for science.

Marty Greenberg, who by this time should have no trouble defending his title as the science-fiction publisher with the best all-around books, has taken a brand-new approach in his latest "theme" anthology. It's a collection of serious articles from the SF magazines, and it's one you should recommend to your local public library. Seven of the eleven articles, incidentally, came from this magazine.

The first three articles deal with the language problem: how do you communicate with the "people" you meet on a jaunt in space and/or time? Willy Ley's "A Letter to the Martians"—in *Thrilling Wonder*, 1940, as "Calling All Martians"—describes the numerous proposals which have been made for communicating with the supposed people of Mars with huge geometric diagrams, patterns of lights, or what have you. Charles F. Hockett continues in "How to Learn Martian"—from ASF—by explaining what is involved in learning a completely strange language, and Sprague de Camp provides a transition into the next section with his classic "Language for Time Travelers"—here in 1938—which points out how greatly our own English language has changed in a few centuries. (Incidentally, there's a brand-new science—"glot-tochronology"—which uses the divergences in related languages to

estimate how long it's been since Italian became distinct from Latin, the present Indo-European languages from Sanskrit, or Hebrew from Akkadian.)

The second block of three articles, including Sprague's, is concerned with time traveling. After the language problem, we have Willy Ley again with "Geography for Time Travelers"—here in 1939—which shows how the map of the Earth has changed from era to era through geological time. And C. M. Kornbluth—no source or date credited—offers a delightful little commentary on "Time Travel and the Law," consisting of several good reasons for staying away from Regency London if you want to keep out of gaol.

The third section of the book takes us into space with another classic from these pages—1943—R. S. Richardson's "Space Fix." This spells out the principles of finding your way from planet to planet, and casts some novel light on the energy problems which bring Pluto "nearer" than Mercury and make Jupiter almost seven times as "far" as Mars or Venus. Then comes a duel between Willy Ley, with "Space War"—here in 1939—and Malcolm Jameson with "Space War Tactics"—here a few months later. Finally Jack Hatcher, in "Fuel for the Future," here in 1940, thoroughly demolishes the food-pill gimmick by showing what space travelers will really need to keep alive on their way to Mars or the third planet of Spludge.

Frederik Pohl has the newest arti-

cle in the book, unless Kornbluth's was written for the occasion: his "How to Count on Your Fingers," which makes the intricacies of binary computation fascinating simple—I guess—was published last year in one of Robert Lowndes' magazines. And Donald F. Reines copes with "Interplanetary Copyright" in a headache-provoking little discussion from, as I recall, an "outside" source such as *Saturday Review* or *Publishers' Weekly*.

You'll think of all kinds of articles that should be in this anthology. I hope it sells well enough so that Marty can publish another some time. Because this, you can be sure, won't be a paperback.

FIRE, BURN, by John Dickson Carr.
Harper & Brothers, New York.
1957. 265 pp. \$3.50

Only by courtesy is this a time-travel novel in the present-day sense, although the way in which Detective-Superintendent John Cheviot steps out of a cab in front of Scotland Yard and stumbles into the body of an ancestor in 1829, when the Yard was just a dream, is really no more offhand than the techniques in Mark Twain's "Connecticut Yankee," or Sprague de Camp's "Lest Darkness Fall."

The purpose of this kind of time-travel yarn, as distinct from those concerned with the paradoxes and gimmicks of the idea itself, is to show some period in the past or future

through present-day eyes. Thus John Cheviot, continually stumbling over customs and relationships that he doesn't know about, must solve an "impossible" murder before a deadline. It may be heresy from a Carr fan, but it seems to me he's become so entranced with his picture of the times that his mystery is no mystery, being solvable by selecting the only possible criminal, in a way that used not to be possible with Carr.

This is the third time the author has used this gimmick. I wish he'd forget his twentieth century observer, and play it straight.

THE CASE AGAINST TOMORROW, by
Frederik Pohl. Ballantine Books,
New York. No. 206. 1957. 152
pp. 35¢

You get here six short stories and novelettes, including one fantasy, ranging from extremely good to not-so-much. Three are from *Galaxy* and one each come from *Fantasy & Science Fiction*, *Fantastic Universe* and *Science Fiction*. The oldest is dated 1954, and three were out last year.

The opener, "The Midas Plague,"

employs the talent for extrapolating twisted futures that the author showed in his collaborations with C. M. Kornbluth, "The Space Merchants" and "Gladiator-at-Law." So does the even better closer, "My Lady Green Sleeves." In the first, we have the tribulations of a young man in a world devoted to mandatory overconsumption, as he treads a precarious way toward social advancement with disgrace and ruin looking over his shoulders. In the second, we have a prison riot in a society where stratification has followed the lines of occupational specialization, with "greasers," "wipers," and "figger-loving" clerks near the bottom of the heap and most crimes those against status and stability. These Pohl does very well indeed: they're worth the price of the book.

The fantasy, "The Census Takers," is a satire of bureaucracy forced to account for one apparently supernatural creature. In "The Candle Lighter," do-gooders and bureaucracy get a drubbing as culture very nearly strips the gears of culture on Mars. "The Celebrated No-Hit Inning" suggests a future for baseball, and "Wapshot's Demon" is just another switch on the man-who-foretells-the-future.



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IN TIMES TO COME

The next—January—issue comes out at Christmas season, and Kelly Freas has done us a Christmas cover. Kelly was in the Army Air Corps during the war; from some of the paintings he's done, one would gather he encountered a number of sergeants that more than matched the traditional specifications. . . .

The lead novelette will be "Unwillingly to School," by Pauline Ashwell. She is genuinely, no-kidding, a new author, not an old one in a new disguise. There has never been a science-fiction story like this before; I am hopefully praying, however, that Miss Ashwell can repeat, and extend the adventures of Lizzie Lee, who must be read to be believed. Lizzie is a teenage girl that I am extremely glad I never met, and delighted to have read about; she's a menace, and in the course of "Unwillingly to School" she breaks every rule of English grammar, punctuation, and composition I ever heard about, and I think invents a few in order to rebel against them, too.

Lizzie is this year's Christmas present to the readers, from Astounding Science Fiction.

THE EDITOR.

THE ANALYTICAL LABORATORY

The reader vote fell off a bit in numbers on the August issue. Hot weather, activity in other directions than taking time out to send in a note, may have had something to do with it; on the other hand, our turnabout analytical move—the reader questionnaire, wherein we find out what you are, rather than what you think of the stories—which appeared in the June issue may have sort of exhausted the readership's tendency to write in.

The questionnaire is still in process of being tabulated; as soon as I have the results of that, I'll publish a complete breakdown on it. I want to thank you for your help, even if the Research Department, currently wading through the problem of tabulating several thousand slips, letters, cards, and other copies and/or substitutes for clipping out the coupon we published, feels you positively overdid the response.

However, results on the voting on August are as follows:

PLACE	STORY	AUTHOR	POINTS
1.	Med Service	Murray Leinster	1.77
2.	The Stainless Steel Rat	Harry Harrison	2.18
3.	Brake	Poul Anderson	2.68
4.	Beast of Prey	Jay Williams	3.72
5.	Love Story	Eric Frank Russell	4.63

THE EDITOR.

(Continued from page 7)

nesses; they didn't have any theory of how such a thing could happen. It just did.

The amateurs who first *used* the phenomenon didn't have the background in cosmology, astrophysics, meteorology, physics of the gaseous state, and a few other needed disciplines, to *explain* what happened. But they were believed by the professionals sufficiently to have professional scientists start looking into the phenomenon—and answers began to emerge. It's called "sporadic-E skip" now—and brother, it's really sporadic, too! Anyone wanting a demonstration of the phenomenon had best get his own ham station, spend lots of time listening, and wait patiently till God, in His own good time, causes it to happen. The right part of the sunspot cycle helps, too, so you might have to wait half a dozen years.

The essential difficulty is this: a demonstration must be believable. And "belief" is a subjective phenomenon, tied to orientation, opinion, previous experiences, and what-not. ("Orientation" is the term for what *we* have; "superstition" is the equivalent term for what *they* have.)

The term "impossible" is one that is normally defined strictly by negation of "possible"—which is defined largely in terms of negation of "impossible." I propose that "impossible" refers to a relationship between a specific action or process, and a specified—or implied—method of

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achievement, and that *it has no meaning outside of that relationship*.

It is impossible to trisect any given angle . . . by the methods of Greek geometry. That is a provable fact, and it will forever be impossible.

It is impossible to transmute the elements . . . by any chemical process. And it will forever be impossible—by definition of "chemical process." You may refine uranium chemically, refine graphite chemically, and set up a reactor employing chemicals . . . but the transmutation of elements that results isn't a chemical process; it's nuclear.

It has been proven that a bumblebee can't fly; it's aerodynamically impossible. It is, was, and always will be, and the proof is perfectly valid . . . in terms of static-winged flight! Lock the blades of a helicopter so they can't turn, and it can't fly either; it would drop like a stone.

A piece of metal which is non-magnetic cannot distinguish one direction from another . . . unless it's rotating rapidly. The properties of a dynamic system cannot be defined in terms of a static system.

Now at any time in the development of knowledge, there are two levels of research and discovery possible; the intensive and the extensive. Discovery can always be made on the basis of a more detailed examination of the already known; logical deduction is of that order. Given a system of postulates and their generated conclusions, an infinite structure of deductions is possible. The number of propositions possible in plane

geometry alone, for instance, is essentially infinite, using the old Euclidean postulates. Deductive exploration and research is an unlimited field—but not *all* the field of possibility. No possible extension of plane geometry can discuss the characteristics of a sphere.

The extensive research must be nondeductive; it adds new levels, new dimensions to be researched. Where deductive research involves intensive development of the known, the intuitive, inductive, or whatever you wish to call it, research involves extensive development into the unknown.

Of the two types, intensive research is by far the easiest; when you have achieved a result, you can communicate it readily and clearly, because it lies within the already-known co-ordinates of the field. Your discovery is an hitherto unrealized implication of the known processes. You haven't discovered a phenomenon dependent on new *laws*, but on new applications of old laws; it is, in consequence, quickly and clearly communicable in standard terminology.

However, when you discover a phenomenon based on no known law, you're in for a tough fight. If the phenomenon is as defined—a valid phenomenon which is based on no known law, but on some still-undiscovered law—it will ordinarily yield two general sets of physical action-results. One group will be actions which are duplicable by known processes, and a second group

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will involve actions that cannot be duplicated by any known process. For example, uranium fission produces heat, which is a well, and long-known phenomenon, duplicable by long-known processes, and, in addition, produces nuclear phenomena which are not duplicable by any long-known process. (Transmutation of elements, for example.)

The second group of phenomena will, inevitably, be "impossible." They are actions which cannot be produced by any hitherto-known method; since "impossible" describes a relationship between a specific action and a specific method, the second group of phenomena are by definition impossible.

The essence of a crucial experiment is that an action is produced which is impossible by known methods. Thus the proof of discovery that a new law exists is to produce an impossible result.

Notice carefully, however, that proof that a new law exists is *not* the same as proving a new law. The old alchemists had theories about "elements," earth, air, fire, and water; their experiments proved that laws of

chemistry existed—but they definitely hadn't discovered what the laws were.

The characteristic of a major break-through in human knowledge can be expected to present the following picture, then:

1. Someone demonstrates an action which is impossible. Associated with it will be a number of not-impossible actions, which can be reproduced by ordinary methods. These will serve to confuse the issue.
2. The demonstration of the phenomena will be highly erratic, and unreliable.
3. The probability is about 0.99 that the discoverer presents an "explanation" that is a wild guess, and a poor one at that.
4. The probability is about 0.9 that the discoverer will be an amateur who stumbled on it by accident. Professionals don't have accidents very often; they know their business too well; when they do have accidents, they take pains to eliminate the wild variable, so that they can

get on with their business. Amateurs, having no business to get on with, will start playing with the wild variable.

5. The first communication of the phenomenon, then, will be from an unknown amateur, who doesn't know how to present his ideas in formal clarity, and probably has the wrong idea anyway.

The probability of the early demonstrations being erratic, unreliable, and unconvincing stems from the simple proposition that if you don't know what you're doing, you're apt to do it wrong. The first stages of the study of a truly new phenomenon ordinarily involve wild misconceptions as to what the cause-effect relationship in the new area "should be." When the first work with batteries was done, there was great mystification that two quite small copper-zinc cells connected together could break down water electrolytically, while a huge cell, with copper and zinc plates a yard square, couldn't . . . yet the big cell could heat an iron wire red hot, while the two little ones couldn't. Concepts of volts and amperes and the difference between them were still years in the future then. It made the behavior of electricity seem most weirdly arbitrary and improbable. It was so obviously irrational that two little cells could do what a big one couldn't.

A barometer is a right handy instrument these days . . . but when the first mercury columns supported

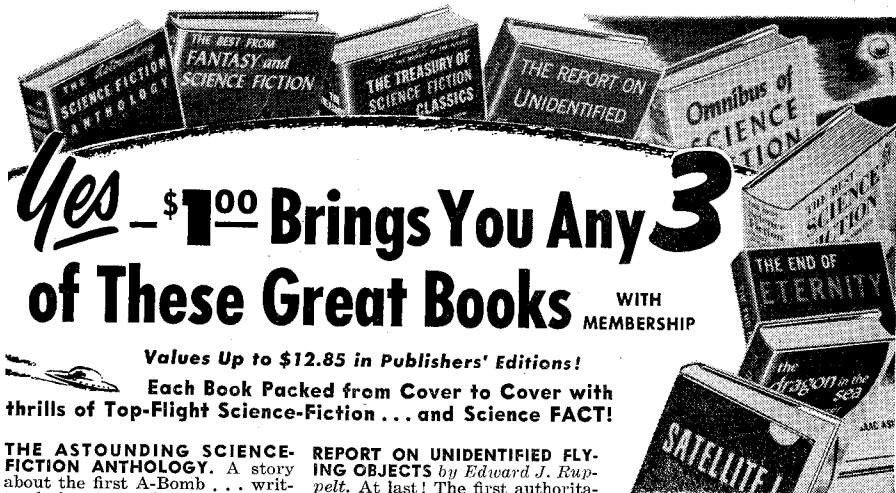
by air pressure were set up, it must have been slightly bewildering. One man's report on the height of the column must have seemed an unrepeatable experiment to other men; imagine the argument a Tibetan monk, a Swiss scientist and an Englishman might have gotten into! (That, of course, has a hidden assumption contrary to fact—that all three workers had a common and reliable unit of length.)

You can have fun, too, trying to define the meaning of the term "obvious," as in the phrase, "From this it is obvious that . . ."

"Obvious" usually turns out to mean "I can see a connection, and it is my opinion that anyone of reasonable intelligence will see the same connection." Any man who has sought to get his wife to explain the "obvious" connection she sees, or sought to explain something perfectly obvious to her, is aware that where there are different methods of thinking-approach to a problem, "obvious" doesn't apply. One just wishes to God it did.

The final difficulty in "demonstration" is more familiar. Most "discoveries" are mistaken. The statistical evaluation of this problem has never been undertaken, so far as I know, but I imagine that it would run something like 10^{12} false "discoveries" for each real one. It's not too unlike the problem of mutations; practically all mutations are mistakes—it's the accumulation of the ones that aren't mistakes, however, that produces evolution.

THE EDITOR



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